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ABSTRACT

Because many of the Veterans Administration hospitals in Appalachia are located great distances from medical teaching facilities, high powered communication satellites have been employed to facilitate quality two-way communication between medical personnel scattered throughout the region. To achieve diagnostic, therapeutic, and educational purposes, the National Aeronautics and Space Administration's (NASA) Applications Technology-6 satellite was field tested in five different modes: (1) video seminars; (2) teleconsultations; (3) grand rounds; (4) out-patient clinics; and (5) computer-mediated events. All five modes provided clear communication and significantly altered the climate of the ten hospitals involved in the experiment. The video seminars were particularly well received. Details of the program evaluation are provided. (EMH)

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The Veterans Administration Experiments in Health Communications on the Applications Technology Satellite (ATS-6)

Final Report

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Abstract

The Veterans Administrations Experiments in Health Communications with the Applications Technology Satellite-6

Many of the hospitals in the Veterans Administration system are located great distances from medical teaching facilities. To reach these hospitals with participatory educational programs and consultation access by traditional communications methodology, such as terrestrial facilities or by traveling specialists, is costly and difficult. High powered communications satellites can potentially overcome these problems, transmitting wide and narrow-bandwidth signals to low-cost receivers.

The Veterans Administration elected to become an experimenter on NASA's noncommercial Applications Technology-6, to field test five types of communications events directed to diagnostic, therapeutic and educational purposes. The hospitals selected to participate in the experiment were located in the Appalachian Region, one of three regions selected for experimentation on ATS-6 due to geographic isolation. The audience-participants were comprised of physicians, nurses and other health professionals.

The five events tested were: video seminars, teleconsultations, grand rounds, out-patient clinics (programs directed to patients) and computer-mediated events.

Video seminars, which included preproduced software, were the most well-received of the events in terms of audience size and usability, according to questionnaires returned by participants. However, all five events met, to some extent, the objectives of providing technically clear and audible, two-way communications by satellite; providing useful information, in an interesting format, which might result in better patient care in the receiving hospitals. The Stanford-based evaluation, conducted for the experiment, indicated that the satellite broadcasts had altered the "climate" of the ten hospitals, so that the professionals practicing there were more receptive to new information.

Communications by satellite are likely to be of great usefulness to the Veterans Administration in overcoming the educational and clinical inequities and isolation of many hospitals within the vast 383-facility system. To be of lasting value, however, the satellite would have to be high powered (to be received on low-cost antennaes), with longer life expectancy (seven years or more), and available continuously at a relatively low hourly cost.

Section I:
The Problem

The Veterans Administration comprises the largest health care delivery system in the western world. It includes some 171 hospitals and 212 out-patient clinics, many of which are located in geographically isolated areas of the United States. Size and geography have created complexity and isolation, the two greatest challenges confronting the VA in the continuing effort to provide its patients with high quality medical care.

Theoretically, the free flow of communications could solve both of these problems. Administrative complexity could be simplified in one way by standardizing and computerizing patient information and data flow among hospitals. Another kind of complexity, created by the constant influx of new information into many fields of medicine, could be dealt with more easily. The information would be more useful and digestible if it were accessible to practitioners at the time they needed it, or when they were otherwise ready to receive and assimilate it.

The problem of isolation might be overcome with freer access to clear, reliable channels of communications. The vital ingredient here would be a two-way channel. A one-way pouring of information into the hospital does nothing to give the individual practitioner the feeling that he can be heard, and therefore has a connection to the outside world.

The technology exists to provide communications hardware and channels to meet all these needs. And, indeed, since the telephone was invented, each new communications device has found its way into settings of patient care. The Veterans Administration has been among the most innovative experimenters and constant users of these devices for providing information, and continuing education in many of its facilities. Still, the value that communications technology might have in overcoming the problems of isolation and complexity within the Veterans Administration—as well as in other medical systems and facilities—is mostly potential, as yet unrealized.

The reason for this: cost, primarily. A second reason is that for a health system as large and unwieldy as the VA's, some means of standardization and overall coordination is needed.

Until very recently, it would have been too costly and very difficult to attempt linkage of all health facilities within the VA system to one another, and to outside medical centers in one, well-coordinated system of information exchange. One prohibitive factor was the terrain that isolates the hospitals; the same topography is also inhospitable to the establishment of terrestrial microwave linkages used for television and some other communications media.

Then, in 1966, the National Aeronautics and Space Administration introduced a communications device that would ostensibly eliminate many of these problems: the communications satellite. A satellite, equipped to receive and transmit communications signals, can replace thousands of miles of ground lines. It can provide two-way television channels, as well as narrow band channels for simple audio or data communications. Potentially, it can interconnect a great many remote sites over a large geographical area.

NASA's sixth satellite in its Applications Technology Satellite (ATS) series was the first with the capability of doing many of these things, particularly for broadcasting two-way television. When launched on May 30, 1974, ATS-6 was to be the most complex, versatile and powerful communications spacecraft ever developed.[14] One of its purposes was to demonstrate the viability of direct broadcast satellite technology with low-cost community receivers.[22] The Satellite was sufficiently powerful that receivers costing less than $5,000 each could be used.

The use of ATS-6 was made available to experimenters by the National Aeronautics and Space Administration at no cost to the users. The initial investment for experimenters would be for ground receivers and for the cost of producing whatever messages they planned to provide during the course of their experiments. To be an experimenter on ATS-6 would mean an opportunity to test the application of new technology with a NASA satellite, prior to making a large monetary investment. For the Veterans Administration, this meant using the satellite for approximately one year to broadcast various types of messages between ten hospitals in a geographically isolated area. The goal would be to test the feasibility of using future, more permanent satellites for many kinds of communications throughout the entire VA system.

BACKGROUND AND HISTORY

The special interest of the Veterans Administration in new types of communications technology is a result of Public Law

89-785, which includes the Exchange of Medical Information (EMI) Act. The 1966 legislation makes provisions for innovative projects that link remote VA hospitals to VA installations located in urban centers, and to major medical centers. The intent was to provide VA health professionals, no matter how remote their location, with access to the most current medical information. The EMI section also states that members of the medical community surrounding these remotely located VA hospitals should be invited to participate in the exchange of information.

The VA Interest in Electronic Media

The EMI enabling legislation specifically mentions electronic linkages as a means by which remote VA centers might receive medical information. Broadcast television could provide such an "electronic linkage," and so could resultant videotaped programs made for television broadcast. In one example of a project supported with EMI funding, the VA contracted with the Medical Television Network (MTN) of the University of California, Los Angeles (UCLA) Extension to provide videotapes of broadcast programs to 30 remotely located hospitals. It was found that physicians, nurses and other professionals gained more from using videotapes at their own convenience than when they had to adhere to a rigid broadcast schedule.[3] Therefore MTN began to distribute programs on videotapes and films, abandoned its closed-circuit television broadcast method of distribution, and changed its name to the Medical Media Network (MMN). By 1971 the VA had expanded its contract with the UCLA-based MMN to provide 90 of its remotely located hospitals with MMN programming.

The VA Interest in Becoming an Experimenter on ATS-6

Although programs on videotape and film, accompanied by study guides, appeared to be an effective way to provide continuing education in the VA remotely located hospitals, this method of distribution did not allow for an immediate interchange between program faculty and learner, which has been suggested as an important ingredient for successful adult education.[4] A VA/MMN Guest Speaker program was initiated to provide for this immediate, person-to-person exchange, if only for a limited number of programs. Participant hospitals were invited to select two programs during the year to be supplemented by a specialist (on the program subject) who would travel to the hospital. The success of the Guest Speaker program serves as additional evidence of the value of direct exchange with faculty for participants in programs for continuing medical education.[5]

The VA health professionals also had another major need, shared by physicians and nurses in all hospitals: in order to provide patients with medical care, based upon the most current information, they require immediate access to specialists in certain fields, as well as to current journals and other media. Many educators believe that finding the solutions to problems as they present themselves from day to day is the best method of adult learning. However, to provide one physician, or one nurse, with an access to all the information sources needed to solve the specialized medical problems they face would require complex communications linkages with major universities, medical libraries, and other repositories, as well as with individuals as consultants. NASA's ATS-6 promised a prototype of the technology that will meet these complex communications requirements in the future, should satellites become a permanent fixture. It would also provide immediate, two-way access to faculty coordinators of programs that videotapes and films cannot provide.

With these capabilities, which could potentially satisfy so many of the needs of VA health professionals in isolated hospitals, the ATS-6 appeared to provide the technology legislators had in mind when they wrote the EMI Act. The decision was made that the VA would become an experimenter on the satellite. Some of the principals of the Medical Media Network, who had formed a nonprofit corporation known as the Foundation for Applied Communications Technology (FACT), were asked to coordinate the experiments and to produce the programs that would be broadcast over ATS-6 during the experimental year (1974-5).

The Decision to Use VA Hospitals in Appalachia for the ATS-6 Experiment

By the time the VA had decided to become an ATS-6 experimenter, three geographical regions had been designated as "footprints" for the satellite. A "footprint" was the area, roughly the shape of a footprint, that could receive usable signals from the satellite when it was beamed at a particular point. The three footprints selected for experimentation with ATS-6, because of their geographical remoteness, were Alaska, the Rocky Mountain area and Appalachia. The Veterans Administration selected ten remotely-located hospitals in Appalachia for its experiments.

STATEMENT OF THE PROBLEM

Health professionals practicing in VA hospitals, many of which are located in geographically isolated areas, require means for communicating on an individual consultant basis, as well as in large groups for diagnostic, therapeutic educational purposes, in order to provide medical care based on current information and research findings.

PURPOSE OF THIS STUDY

The purpose of the VA/ATS-6 experiments was to determine whether satellites can provide the technology to meet some of the communications requirements of the VA, from telephone conversations to two-way television consultations, on a cost-effective basis.

LIMITATIONS

When the VA experiments on ATS-6 were conceived, they included the following aspects which had to be redesigned, owing to unforeseen problems:

1. Two-way Communications

The satellite had the capability of transmitting television signals, and was said to be accessible to receive signals from any point, within any one footprint, at any one time. The original design was based on the expectation that transmission would be on a frequency bandwidth of 2250 mhz, and satellite transponders for all HEW and the VA experimenters were built with that band in mind. For the VA experiments, a mobile unit, outfitted with an inexpensive transmitter, was planned for reaching the satellite. The mobile unit would travel from hospital to hospital, originating programming that other participating hospitals could receive on television sets linked to inexpensive receivers.

The 2250 mhz band was, however, under the jurisdiction of the Department of Defense. It was expected that the DOD would relinquish the frequency for the period of the satellite experiments. In April 1973, in meetings between the Department of Health, Education and Welfare, and the Department of Defense, the DOD refused to relinquish the frequency in the

Appalachian region, on the basis that it was needed for national security.

Experimenters had the choice of building new transponders to receive signals in the 6 ghz bandwidth (at a cost of several million dollars), which could send signals from Atlanta that would be received somewhere in Canada but not in the southern portion of Appalachia; or they could use permanent, large earth stations that have their own frequencies, which the satellite was equipped to receive. The experimenters in Appalachia chose the latter alternative.

A. Selection of an earth station

The permanent earth stations were located in Rosman, North Carolina; Denver, Colorado and the Mojave Desert. The most proximate earth station to the Appalachian Region was the one in Rosman, N.C. The use of this earth station was especially appealing because the National Medical Audio-visual Center (NMAC) in Atlanta had offered the use of its television production facilities at no cost, for the duration of the VA/ATS-6 project. Land lines and microwave equipment would have to be installed to link Atlanta with the Rosman earth station. At first this appeared to be an inconsequential step in reaching the satellite. When costs of installing this equipment were quoted, however, they were so high that by comparison it was less expensive to originate programming in Denver. The Federation of Rocky Mountain States had already installed facilities for broadcasting its own programs to the Rocky Mountain States, including a major earth station nearby at Morrison, Colorado. It was thought that the VA experiments might also originate from the Federation studios, but the fee quoted for use of the studios was high, so that a less expensive alternative was to use the facilities of commercial CBS-TV station KMGH in Denver and lease microwave equipment to send signals to the Federation's facilities, where they could then be transmitted to the earth station and then to the satellite.

B. Simulation of two-way interaction

The important aspect of two-way interaction, which the satellite was originally to have provided, now had to be simulated with traditional land lines. Testing the two-way aspect was considered important, even though it wasn't actually carried by the satellite, because it was thought that future satellites will have the capability of transmitting two-way television and other signals, a capability that would appear to be of particular importance to the Veterans Administration.

Traditional telephone lines could carry audio signals on a conference call basis. Because of the cost of these lines, the decision was made to have only five lines open to the studio. The ten hospitals were divided, geographically, into two networks, identified as green and red.

The plan was to ask the five hospitals in each network to call in at different times to ask questions or make comments during the broadcast period.

The video portion of the television signal was thought to be of great importance during two-way consultations between physician or nurse and specialists. X-rays, cardiograms, scans and other visual aspects of case presentations would be vital to these consultations. Some method had to be devised for sending visual signals from the hospitals to the studio where consultant specialists would be located. It was decided to use slow scan technology, capable of sending visual information, scanning it line by line, via telephone, to a television receiver.

C. Simulation of hospital broadcasts

Another important potential use of satellites would be for hospital-originated communications as opposed to studio broadcasts. Potentially, satellites will enable hospitals to send in-house programming, as well as individual messages, to other hospitals and medical teaching centers. To simulate this aspect of satellite technology, the decision was made to incorporate the mobile unit originally planned for field production. Instead of sending signals via the satellite, the mobile unit would be equipped to make videotapes, which could be sent to the Denver studio in time for broadcast, and with a slow scan transmitter, for sending visual information the day of broadcast.

2. Experimental Control

As is the case with most adult educational projects, it was difficult to isolate learners and the variables that would affect knowledge gain, so that one could say definitively that changes in patient medical care occurred because of one program, or several programs, broadcast over the satellite. During the broadcast period there were other forms of on-going postgraduate education and in-service training in each hospital. Staff members in participating hospitals were transferred to other VA's or elsewhere and new members came in during the experimental period. To further complicate matters, videotapes of the programs were distributed widely (in a few instances even to VA hospitals selected as controls for the experiment).

Furthermore, the hospitals selected to be experimental for the project were not selected on a random basis. For practical and technical reasons, they were selected on the following bases:

A. They were within the geographical footprint that could receive transmissions from the satellite.

B. They were relatively remote from a major medical center in most instances.

C. They had a large case load of general and medical-surgical patients (with one exception: Salisbury, N.C. was the only neuro-psychiatric center selected to participate) in order to narrow the scope of appropriate subject matter for programs.

D. They had indicated an interest in participating.

The VA hospitals selected were those located in: Salem, Virginia; Mountain Home, Tennessee; Beckley, West Virginia; Clarksburg, West Virginia; Altoona, Pennsylvania; Wilkes-Barre, Pennsylvania; Dublin, Georgia; Asheville, North Carolina; Salisbury, North Carolina; and Fayetteville, North Carolina.

ORGANIZATION OF THE REPORT

The remainder of this report will discuss the experiments designed for the VA/ATS-6 project, how they were accomplished and their outcomes in the following sections:

Section II: The Experiments

Section III: The Procedure

Section IV: Observations

Section V: Data (The evaluation report submitted by Applied Communications Research)

Section VI: Summary, Conclusions and Recommendations

Section II:
The Experiment

The communications satellites created during NASA's Applications Technology Satellite program were much like the telephone or television in that the technology appeared before most people realized they had a need for it.

In the case of the Veterans Administration, however, once the capabilities of the ATS-6 became known, a number of uses for the satellite became obvious. It seemed advantageous to test the satellite for these uses, in a limited number of hospitals, for potential use throughout the VA health system.

The experimental events subsequently designed for the VA's validation of the satellite had been tried in other forms and in traditional contexts, with varying success. Although there would be subtle changes from the VA/ATS-6 experiment, such as an emphasis on high-quality production of programs, the most significant variable to be tested was the satellite itself.

Designers and manufacturers of the ATS-6 claimed that it would deliver television pictures more clearly than could be received on home sets and a signal that would be unaffected by weather or terrain. The claims were potential, however, until someone attempted to broadcast television signals via satellite.

Testing and validating the ATS-6 was an important conclusion to NASA's Applications Technology Satellite program. The program had resulted in technology that eventually could provide many kinds of communications, including television directly to schools, hospitals and other institutions—even to individual homes—through inexpensive ground receivers. Almost anyone could become a broadcaster by satellite; and anyone able to afford a ground terminal could become a receiver. The technology had far-reaching potential applications, and NASA was offering experimenters an opportunity, free of charge, to find those applications. Then, if the satellite was all it was purported to be, successfully transmitting many types of communications signals, its commercial value would result in future manufacture of geosynchronous communications satellites, but they would be underwritten by private enterprise rather than by the Federal Government.[5]

COMMUNICATIONS BY SATELLITE*

Important to the VA in its decision to become an experimenter with the ATS-6 were the results of past experience of others with previously launched satellites in NASA's ATS series.

Background of ATS Program

The first Applications Technology Satellite launched was ATS-6, in December 1966. A number of special television events were relayed by ATS-6, including ten hours of Canada's Expo '67 to Australia. Most relevant to the VA however, were the medical communications to Alaska. ATS-1 provided a two-way radio contact between native health aides in remote Alaskan communities and a Public Health Service doctor in the Alaska Native Medical Center in Anchorage. Traditional communications by high-frequency radio had been unreliable, and the system by satellite soon provided a service heavily relied upon by the Alaskan natives.[9]

ATS-2 was launched in 1967. A failure in the fuel supply system of the Agena rocket, used to launch the satellite, caused it to assume an elliptical orbit. The ATS-2 tumbled and rotated. The spacecraft re-entered the earth's atmosphere on September 2, 1969 and was destroyed.[15]

ATS-3, launched in 1967, was significant for its ground-to-spacecraft-to-aircraft communications over the Atlantic, a demonstration of which took place on November 21, 1967. It also transmitted the first color photograph of the earth from

* The following discussion of satellite technology and of telecommunications in medicine is not meant to be an inclusive overview of all experimentation and demonstrations of communications technology applied to medical care. For more thorough discussions of satellites and their application to social services, please see: Filep, R. and Wedemeyer, D. *An Analysis and Annotated Bibliography in Communication Satellites for Social Services: Focus on Users and Evaluation.* Learning Systems Center, University of Southern California, 1975.

space, and was used for ship-to-shore communications for the management of shipping fleets.

ATS-4, launched in 1968 by a Centaur missile, was left in a 100 by 400 nautical mile orbit because the Centaur's second ignition was not accomplished. ATS-4 re-entered the earth's atmosphere and was destroyed.

ATS-5, launched in 1969, is being used for ranging tests, specifically for the Maritime Administration to determine line-of-position of ships. ATS-5 has also been used for teletype transmission, ionosphere propagation tests, weather experiments, and other tests, some involving aircraft in measurements of multipath effects and tone ranging.

ATS-6: Potential

ATS-6 was to be the most complex and powerful communications satellite ever launched. The more high powered the satellite, the less expensive the ground receivers need be, and the goal was to provide high powered signals to a large number of small, inexpensive stations, located over a large area on the earth.

Such satellites could be highly useful to a system as widespread and complex as the Veterans Administration. Once the satellite had been designed, developed and launched, communications (from two-way television to transmission of photocopied letters) might be cost effective as compared to traditional communications. To be an experimenter on ATS-6, to test the feasibility of such a satellite communications system for the VA, was a significant opportunity.

THE VA/ATS-6 EXPERIMENTAL EVENTS

The Veterans Administration experiments on ATS-6 were to be based upon two general communications requirements:

A. The need for access to specialists for consultations; and

B. The need for continuing education that incorporates learner participation.

A two-way linkage was implied in both of these requirements.

Practical experience with the Medical Media Network, supplying videotaped programs to VA hospitals,[4] and research evidence supports the existence of these two basic needs. In a study undertaken to identify informational needs of the Appalachian medical community, needs that might be met using the ATS-6, Singh and Morgan state that

> One of the major problems with physicians, para-professionals, and medical students working in the rural areas is difficulty in maintaining contact with professional developments. There are also problems related to on-the-job training of para-professionals because hospitals and health departments generally cannot afford to send a recruit away for institutional training.[16]

The report goes on to suggest tele-lectures, computer-assisted instruction and tele-conferencing as methodologies for resolving these problems.

Active participation during the presentation of continuing educational programs is considered a vital ingredient by most specialists in the field of medical education.[21] Experience has shown that even a week's delay in answering questions resulting from a videotaped program leads to a decreased interest in the answers to the questions, and therefore less learning. Immediate interchange between learner-participant and the instructor is far more satisfying.[18]

Based upon the VA's communication requirements, their own experience, and the research evidence, the principals of the Foundation for Applied Communications Technology (FACT) designed five experiments or "events" for trial on ATS-6, all of them incorporating the two-way linkage as a primary ingredient. These were categorized as: video seminars, grand rounds, out-patient clinics, teleconsultations, computer-assisted instruction and computer-managed patient history taking. VIDAC, a technological experiment that will be described in a later subsection, was added after the experimental period began, but was not part of the basic research design for the overall VA experiment.

In the remainder of this section on the experiments, each of these "events" will be described. A subsection will be devoted to each one, explaining the experimental design as well as the historical background that lead to the event's selection for the VA/ATS-6 experiment.

1. VIDEO SEMINARS

Background

Television in its various forms, from live broadcast to videotaped programs, has been thought of as a potential substitute for the in-person lecturer. In some cases, it was thought, television would be even better than live demonstration because it could show close-ups and edit out visual "noise" that would distract from the instructional message. Furthermore, a well-produced television tape, using charts, diagrams, perhaps even animated sequences, could present the information in the most clear and concise manner, and an instructor would have to prepare his presentation only once for an unlimited number of learners. Based upon these premises, television has been tried in numerous modes, from closed and open-circuit broadcast to the cycling of videotapes among institutions, with the intent of providing continuing education for physicians and nurses, as well as in-service training for para-professionals, with varying results in terms of changed learner behavior, and the ultimate test of medical learning: improved patient care.

In instances where television had been used unsuccessfully as a medium for continuing medical education, some said that the primary reason for failure was poor production. Amateurish, low-budget programs featuring primarily the "talking face" to deliver didactic information, could not hold the attention of sophisticated learners accustomed to commercial television.[8] Well-produced programs, on the other hand, and programs featuring familiar modes of education such as grand rounds, had resulted in some evidence of changed behavior on the part of medical professionals.[20]

The video seminars for ATS-6 were intended to do more than present a canned lecture. The goal was to go as far as possible toward providing in-person communications for the medical professionals in the ten Appalachian VA hospitals, substituting a visit via satellite for actually sending consultants to each of the remote locations. Viewers of commercial television will tell you that they feel they know certain TV personalities just from seeing them on a regular basis. If Carol Burnett and Johnny Carson can establish such a familiar relationship with viewers, why couldn't medical educational instructors with dynamic personalities?

McLuhan[11] and others have suggested such an interaction with television instructors is possible. Actual experience with two-way interaction with radio and television instructors had not borne this out, however. When two-way radio programs were broadcast for physicians in the Intermountain region, most physicians only listened rather than asking questions themselves.[5] In two instances, two-way audio with television also failed to generate much physician participation in the form of questions and discussion. Two-way open-circuit broadcasts were tried in the Intermountain region, and closed-circuit

"scrambled" programs were broadcast in Los Angeles. In both cases, physicians did not participate significantly in the two-way portions of the programs.[3,4] In both instances production quality was suggested as a reason for failing to motivate viewer response. Experiences of two other groups [16,17] suggested that the use of short preproduced programs, followed by live question-and-answer periods were a successful means of providing continuing medical education.

Video Seminar Design

The producer-coordinator of the VA/ATS-6 experiments believed that a primary facilitator for overcoming the barrier created by the television screen between instructor and audience would be a continuing moderator of proven on-camera abilities to host the weekly programs. The moderator would have to possess special qualities: he would have to be a physician in order to handle the subject matter; he would have to be acquainted with numerous medical specialties, relate well with other medical specialists who would appear on the programs as consultants, be an excellent instructor generally, and generate charisma on the television screen, an ability not common among classroom instructors.

The moderator would provide continuity within each program, and from week to week, between programs. He would begin the video seminars by introducing the subject, the faculty and the panel members for the program and then lead into the preproduced film or videotape on the program topic. These preproduced materials would be didactic and short. Their goal would be to generate a common ground for questions and discussion among audience participants. Once the film or videotape had been shown, the moderator's next task would be to urge two-way discussion by asking members of the red or green network to call on the telephone lines available to them. While waiting for calls, the moderator would have to be prepared with his own questions for the consultants and to stimulate questions on the part of the remote participants. The moderator would have to be able to adroitly interrupt panel members when telephone calls came in, and cut off discussions when time ran out at the middle and end of the broadcast period.

The goal of the video seminars was to present didactic material on an identified informational need, within the participating hospitals in well produced, short films or videotapes, a format that had been somewhat successful in the past, and then add elements that were thought to be needed to motivate interest on the part of health professionals: live participation and immediate feedback. In addition, printed study guides, which had also proven to be an asset to instruction,[4] were to be sent out in advance of the video seminars to be used as a supplement to the programs. The study guides would begin with program objectives in terms of behavioral and attitude change, as well as in terms of improved patient care. The content of study guides for individual programs would vary, but each would include instructional material relevant to the program (sometimes the script of the preproduced portion of the video seminar) and a bibliography. Many would include illustrations and diagrams plus complicated charts that would not reproduce well on television.

Evaluation of Video Seminars

Success of the video seminars would be evaluated in terms of knowledge gain, attitude and behavioral change on the part of viewer participants, and patient care outcomes. Also important would be the subjective response of participants to the programs specifically and generally, particularly in terms of potential use as a permanent means of continuing education.

2. GRAND ROUNDS

Background

Previous experience, of which the already-cited report of a two-year experience in Ontario is just one example, indicates that grand rounds can be a particularly popular mode among physicians for continuing medical education, a mode that works well when televised. The fact that grand rounds involves two-way interaction between presenter and his audience made this mode appealing as an experiment "event" for ATS-6.

Grand Rounds Design

Once again, the continuing moderator would host the program. As in video seminars, he would introduce the faculty coordinator to present case histories, their diagnosis and treatment. Each grand rounds event would cover a subject identified as an informational need by participants in the hospitals. Participants would then be able to ask questions concerning the case presentations and the subject matter generally.

The goal of the grand rounds events was to simulate institutional rounds on television and still maintain the production quality of the video seminars. Loss of satellite frequencies (described earlier) meant that grand rounds programs could not be originated live from hospitals (except for two programs that were originated from remote locations during the experimental year by leasing microwave circuits), although it is clear that such hospital-based transmissions are preferred by viewing physicians and nurses.

Grand rounds were not supplemented with study guides because the information covered was to be spontaneous at the time of the broadcast. This meant that faculty coordinators of the grand rounds could not list objectives for knowledge gain, behavioral or attitude change, or necessarily for patient care outcomes.

Evaluation of Grand Rounds

Grand rounds events would be evaluated for success technically, in the ability to simulate grand rounds and broadcast them over the satellite and at the same time maintain high production quality that would interest viewers in participating in the program.

3. OUT PATIENT CLINICS

Background

Television is accepted as an effective means for providing adult education, as witnessed by the existence of a large number of educational television stations supported by public funds and by universities and other educational institutions. It was postulated that patients might be able to learn about the treatment and rehabilitation for their own diseases by receiving televised instruction, using the same components and concepts that would be used for the video seminars; i.e., a preproduced film or videotape, discussion by faculty coordinators and panelists, and opportunity to ask questions.

Although the EMI enabling legislation does not specifically provide for patient education, it was felt that the inclusion of a small number of patient education programs was appropriate for the VA/ATS-6 experiment because the methodology could relieve professional staff from the responsibility of patient education. At the same time these professionals might

learn new methods of instruction and perhaps some new concepts in treatment and rehabilitation concurrent with their patients.

Out-Patient Clinic Design

The subject matter for out-patient clinics would be based upon the most common needs for patient instruction among the ten participating hospitals, as indicated by the nurses and others involved in patient instruction. The selection of topics for these events also would be according to material that would be adaptable for television.

Programs would begin with an introduction of the subject and faculty by the moderator, followed by a preproduced program on the subject, a discussion and time for questions and answers open to the patients and their families in the participating hospitals.

Evaluation of Out-Patient Clinics

Out-patient clinic events would be evaluated for their success in changing behavior and attitudes on the part of the patient, as well as for knowledge gain.

4. TELECONSULTATIONS

Background

Those individuals who have taken a special interest in the education of the postgraduate physician have found that learning is most effective, in terms of changed behavior, when it is self-generated, problem oriented, and related to routine, day-to-day practice.[23]

Another ingredient said to motivate physician attention to programs is presentation of somewhat controversial material;[7] while a negative influence is when the subject matter is too nontechnical.[10] These and other factors were taken into consideration when the teleconsultations were designed as an experimental event for ATS-6.

Television had been used successfully in diagnosing emergency medical problems at the Logan International Airport Medical Station of the Massachusetts General Hospital. In this situation, nurse-clinicians at the airport clinic made an initial evaluation of patients, then presented cases requiring physician attention via television to physicians at Massachusetts General Hospital.

> Inspection, auscultation, and interpretation of roentgenograms and microscopic images were readily performed despite the intervening distance. Percussion and palpation were done by the nurse clinician. Rapport between the physician and his patient was readily established.2

As described in the previous section on **The Problem,** the original concept was to televise case presentations from the participating hospitals to the Denver studio, where specialists would be available for consultation. All of the elements described in the Logan Airport study could have been incorporated for the teleconsultations. When the Department of Defense denied use of the frequencies needed to transmit signals to the satellite from points within the footprint area, however, the concept of generating wide-band television signals from any of the participating hospitals had to be abandoned.

Another method was needed to send visual signals to the consultants in the Denver studio. Slow scan technology was suggested for this purpose. The original proposal to perform the experiments on ATS-6 on behalf of the VA, submitted by FACT early in 1972,[1] suggested that slow scan technology should be tested on the satellite strictly as an engineering experiment, to see whether the technology coupled with the satellite might be of use to the VA. When the frequencies needed to send television signals were made unavailable, slow scan was incorporated into the teleconsultations for sending visuals from the remote locations to Denver.

Slow Scan Defined

Slow scan television is a technology that makes it possible to send visual information over a telephone line by breaking an image down into electronic signals that are reassembled at the receiving end by scanning the image, line by line, on a television monitor.

Previous Use of Slow Scan to Provide Medical Information

A prototype slow scan system was constructed by a national electronics firm for the University of Wisconsin, Department of Postgraduate Medical Education, for use in continuing medical education programs. The intent was to use slow scan to make available, on a broad geographic basis, the more than 50 medical educational events weekly occurring at the medical center. Before investing in slow scan on a large, permanent basis, however, the prototype system was to be tested on a small scale. From the period of May through June 1970, the prototype system was tested in lecture situations in three community hospitals and one Veterans Administration Hospital. The prototype was considered unusable, and the experiments generally unsuccessful, primarily due to technical difficulties. The principals involved in the experiment recognized slow scan as having great potential value as an inexpensive means of providing education and they stated that experimentation with the medium would continue at the University of Wisconsin.[2]

In 1973 members of the University of Wisconsin Extension reported that the slow scan equipment was being modified for a satellite communications experiment, but that general use of slow scan for medical education was not being pursued.[17]

Two major problems encountered by the Wisconsin experimenters were inherent in the prototype system. First, due to the time required to scan visuals (1 minute 8.5 seconds for fast scan with a horizontal resolution of 160 lines; 2 minutes 17 seconds for a high resolution of 320 lines needed for most visuals used for medical purposes), the slow scan could not keep pace with several of the lecturers. The lecturer would have to pause in his presentation to wait for the next visual to appear, even though the prototype system had capability of storing four visuals in advance of the program. The second problem was that 46.61 percent of the visuals displayed at the remote hospitals using slow scan were judged unacceptable for technical reasons.

Another group in Los Angeles used a different system, produced by another electronics company, for transmitting radionuclide images.[21] In this study, 90 scintillation scan examinations were transmitted by slow scan to physicians, who viewed the scanned images and made interpretations. These interpretations were later compared with interpretations made directly from the same films. In 68 of the 90 examinations, the two interpretations were the same. The experimenters listed the limitations of the system: resolution was grossly inadequate for routine radiograph transmission; the system was

unable to detect and transmit small changes in image density at the white end of the gray scale, and so some film of low contrast could be interpreted directly but could not be transmitted successfully; accurate interpretation of printed material was limited to block lettering one inch or larger. The Los Angeles experimenters, like the Wisconsin group, saw great potential for the system once it had been refined and the technical limitations overcome.

Even if the technical problems of slow scan could be overcome, the designers of the VA/ATS-6 experimenters wondered whether some visual information, such as X-rays and EKGs, could be used for diagnostic purposes when displayed on television under the best circumstances. Prior to the experiments with closed circuit telediagnostics at Logan International Airport, a study was made of microwave transmission of roentgenograms (X-rays). One hundred were transmitted to a panel of three physicians at Massachusetts General Hospital for interpretation. Their interpretations were compared to those made directly from the films by a hospital radiologist. The panelists agreed on classification in 92 of the 100 cases. The panelists' findings were compared with those of the hospital radiologist, and there was no disagreement in 77 percent of the cases. A tendency to classify disease one category greater in severity accounted for the major difference between the panelists' interpretations and those of the hospital radiologist. The zoom lens of the television system added some capabilities not available by conventional radiographic methods, as did control of the intensity of illumination of the view box and control of contrast and brightness on the television monitor. Apparently televised roentgenograms could be used for some diagnostic purposes.

Colorado Video, Inc., the electronics firm that had manufactured the equipment used in the Los Angeles radionuclide image experiment, displayed their slow scan equipment, which they had refined since the Los Angeles experiments, for the FACT staff. Higher resolution had been achieved, and the system was now capable of storing 27 black and white visuals and one color visual prior to broadcast. It was unlikely that it would be necessary to let air time on the satellite go by while everyone waited for a visual to be scanned, except when color was required for more than one illustration.

Design of the Teleconsultations

As for all of the programs, the moderator would introduce the subject of the teleconsultation and the consultants who were in the studio to discuss the topic. Case presentations would follow. They would be videotaped in the VA hospital responsible for the teleconsultation during the week prior to broadcast. The videotape would be sent air express to Denver in time for the Wednesday broadcast.

Once the cases had been presented, physicians and or nurses and studio specialists would begin. Slow scan images would be used during this live portion of the program. The visual sent via slow scan might be roentgenograms (X-rays), pathology slides, or any other still picture, including those taken from a live, dynamic situation and "frozen" by a special device.

The goal of the teleconsultation events was to answer the specific, technical questions of Appalachian physicians and other specialists. This meant that general interest of a large audience would probably have to be sacrificed. Viewers in the other nine hospitals could look on while the physicians and other specialists consulted with the panelists in Denver, but whether or not they found the programs interesting or useful would not be important. The teleconsultations would provide information, on as close to a one-to-one basis as possible.

Evaluation of the Teleconsultations

The objectives to be evaluated in the teleconsultation events would include engineering objectives (is consultation via television, satellite and slow scan technically feasible?) and attitude change objectives on the part of physicians and nurses in the participating hospitals, the consultants in the Denver studios and possibly patients whose cases were to be considered in the teleconsultations. These attitudes would have to be measured subjectively by asking the individuals how they felt about the teleconsultation experiences as opposed to the way consultations are usually conducted (in person or by telephone).

5. COMPUTERIZED EVENTS

Computer-assisted instruction was one of the methodologies suggested in the Washington study[32] for experimentation in medical communications for Appalachia on ATS-6. Once the decision had been made to comply with this suggestion, the next step was to select computer programs that could most benefit the physicians, nurses or other personnel in the ten VA hospitals. After a brief search that primarily revealed the number and scope of available programs, an approach was made to the Lister Hill Center Computer-Assisted Instruction (CAI) Network. The LHC had a vested interest in the health experiments on ATS-6, and several members of the network, including Massachusetts General Hospital and the University of Illinois, had programs that appeared useful to VA professional staff members, especially to technicians and nurses.

The chief of the research and development branch of the CAI Network was contacted concerning the availability of the programs for experimentation on ATS-6 in the ten VA hospitals. His reply was not promising, both in terms of expense and interest on the part of the Network and its members in participating in the satellite experiments. Directors of the CAI programs at Massachusetts General and at Illinois were contacted individually. The director of the Masssachusetts General Hospital was not interested in investing his time to make the adaptations to his system, necessary to link the hospitals to the computer via satellite rather than telephone line. The Illinois program had been discontinued temporarily. Then, about a month before the broadcasts were to begin on ATS-6, a representative of the Illinois CAI program wrote a letter inviting VA participation with linkages to the computer, via satellite, to be arranged by the Lister Hill Center. By that time arrangements had been made to use two other programs.

The programs selected appeared to meet the needs of specific groups of professionals practicing in the VA hospitals. One program, designed to teach clinical decision making, seemed well suited for nurses who would be trained to assume new roles as heads of wards and admitting rooms. The second computerized program was to enable patients to take their own psychiatric and social history by responding to a battery of self-report instruments. This computer-managed program seemed to meet a need in VA psychiatric hospitals for early patient evaluation, prior to case disposition, for more effective management and treatment.

The computers for both events were located in Salt Lake City, Utah, a location well-suited geographically for the experiments, because linkage to the satellite uplink required telephone lines only between Denver and Salt Lake City.

Connections with the University of Illinois or Massachusetts General Hospital would have required far more extensive land lines and more complex connections.

Another fortunate happenstance was that ATS-3, a previously launched satellite, became available to ATS-6 experimenters. This meant that computer signals could be sent to the experimenting hospitals by ATS-6, and the return signal would be carried by ATS-3, rather than by telephone line as originally planned. This arrangement would only simulate what it would be like to communicate full circuit with a computer via high powered satellite, such as ATS-6, but the simulation would be much more approximate than using land lines for the return link.

Design of Computerized Events

Computer Training in Clinical Decision Making

The computer for the CAI program in clinical decision making was located in the University of Utah Biophysics Department in the Latter-Day-Saints Hospital, Salt Lake City. Designer of the CAI program, and head of the Department, Dr. Homer Warner, asked that a pre-test be made of the program's acceptance by VA nurses, prior to offering the program via satellite. The reason for this was that satellite time was severely limited, especially by the requirements of the computerized experiments that both ATS-6 and ATS-3 be available simultaneously. This meant that the computer would be accessed for a maximum of two and a half hours weekly, during the broadcast period allotted to the VA on ATS-6. This limited access time would not allow a fair test of the CAI program itself, and so it was to be validated in a two-week pretest, during which it would be offered to a VA hospital via telephone, 24 hours a day.

As originally conceived, the hospital receiving the program by telephone would limit its access to the computer, voluntarily, to the two and a half hours during which the same program would be provided to a second hospital via ATS-6. For reasons that will be described in the Section on Procedures, this did not work out, and the two tests comparing telephone linkage with satellite connections to the computer were made consecutively rather than simultaneously.

Evaluation

The CAI program designed by Dr. Warner's group was intended to train medical students in history taking and diagnosing, using a probabilities game. It was to be evaluated for knowledge gain, particularly among the nurses who used it in the telephone-connected hospital, and technically for potential use of a high powered satellite to make such a computer program available to VA hospitals generally.

Psychiatric-Social Self Report by Computer

The objective of this experiment was to determine whether a successful computer-patient interchange could be achieved by satellite, an interchange in which a patient would respond to psychiatric-social instruments presented on a cathode-ray tube. The responses would then be analyzed for a computer-generated report to be used as the basis for case disposition. If such a computer-satellite connection could be managed, it would mean that the same battery of psychiatric-social instruments could be used at the entrance to all satellite-linked VA psychiatric services. A patient would participate in self-analysis tests at the entry point, rather than taking tests during his treatment at a time convenient to staff members. The self-assessment would not only save time of professional staff

Evaluation

The computerized patient self-assessment events would be evaluated for the engineering objective of making the computer-satellite connection. A comparison would be made between the patient interacting with the computer via satellite, and a patient interacting with the computer locally, in the same building housing the computer. Subjective responses of patients and psychiatrists in charge of the experiment in the receving VA hospital, as well as those individuals operating the computer, would be added to the evaluation of this computerized event.

6. VIDAC

VIDAC (Video-Audio Compressed) is a system developed by Westinghouse Electric Company for transmitting and storing audio-visual, still-frame programs in a greatly compressed form. Generally, the ratio in real time to compressed time for programs containing both audio and visual material is 240:1, so that in two minutes of transmitting, a maximum of 24, twenty-minute audio-visual programs can be sent to, and stored in, a distant facility.

In compliance with a request made by Westinghouse and approved in the VA Central Office, an agreement was made to test the VIDAC system on ATS-6 by transmitting the compressed programs to one hospital at the end of the VA's two-hour broadcast for ten weeks. The VA hospital in Dublin, Georgia was selected to receive the transmissions and participate in the VIDAC experiment. The physicians and nurses at the hospital would select the programs they wished to view and these programs would be stored for the week following transmission. They would then be viewed on the in-house television system at Dublin.

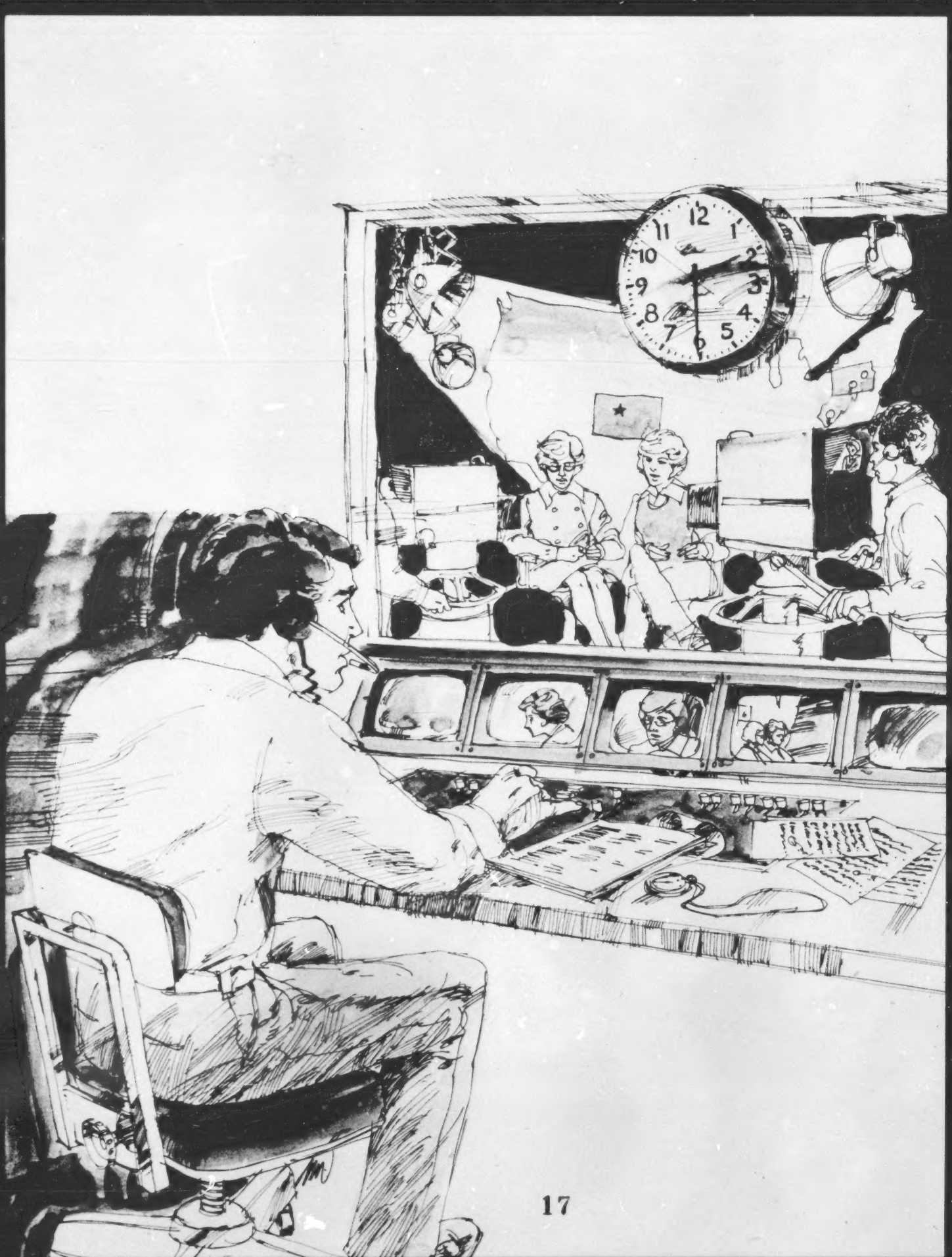
Evaluation

Evaluation of the VIDAC experiment via ATS-6 would be undertaken by the Center for Educational Technology at Florida State University. Evaluation would determine the proportion of the potential audience who used the programs, how frequently individuals used it, and the patterns of utilization according to time, and clusters of viewers. The system would be evaluated technically, and the signal would be evaluated for clarity of video and audio channels. Audiences would be asked whether the lack of motion and interaction were shortcomings of the system. No attempt would be made to evaluate the programs themselves for their contributions to knowledge gain, behavioral change or other such objectives.

SUMMARY

In planning these five experimental events, the designers realized that the human factor would be an important variable influencing the outcome of the experiment, as important as the technology. The ways in which different individuals influenced the experiment, from installation of equipment, through production and, then, response to these five events, could not have been predicted.

What actually took place from the design stage of the experimental events through 44, two-hour broadcasts of programs will be described in the next Section: **The Procedure.**



Section III:
The Procedure

The principal goal of the VA project on ATS-6 was to conduct an experiment, not to establish a service. The Project Director and Coordinator were well aware of similar projects, demonstration and experimental, that had come to be relied upon as a service, so that individuals involved could no longer be objective about the successes and failures of what they were doing. The very human tendency on the part of the program producers to want the project to be successful was a factor that had to be recognized and set aside, as were the biases in the other direction, on the part of the program recipients and others, against all such electronic intrusions into their professional lives.

Other positive and negative biases were apparent when the project was inchoate, in fact from the time it was first discussed by members of the Veterans Administration Central Office and its advisory groups. At that time, views against expensive satellite technology were aired and considered, along with those in favor of taking advantage of an opportunity to test satellite communications with an eye toward possible future general applications within the VA system. In the end, the Administrator's Special Medical Advisory Group approved the VA becoming an investor as an experimenting agency, and the VA/ATS-6 experiment was undertaken by the Office of Academic Affairs, of the VA's Department of Medicine and Surgery. The Deputy Director of the Learning Resources Service, Robert B. Shamaskin, was deisgnated Project Director. The Foundation for Applied Communications Technology was contracted June 1, 1973 to coordinate the experiment.

The experiment was conducted in three stages:

Stage I: Organization and Needs Assessment (June 1, 1973—February 15, 1974)

Stage II: Preproduction (February 15—June 30, 1974)

Stage III: Implementation (July 1, 1974—May 20, 1975)

Formative evaluation was undertaken during each of these three stages, and a summative evaluation followed after the Implementation stage was completed. The results of the evaluations will be reported in Sections IV and V of this report.

In this Section, the three procedural stages of the experiment will be described.

STAGE I: ORGANIZATION AND NEEDS ASSESSMENT(June 1, 1973—February 15, 1974)

The first steps in organizing the experiment were to: (1) bring together the resources required for the experiment, both within and outside the ten participating VA hospitals, and (2) conduct a needs assessment that would be the basis for program subjects during the satellite broadcasts.

Organization of Resources

A great variety of human and technical resources were needed for the VA/ATS-6 Experiment. Organization of the human element came first, as liaisons were formed with several organizations and agencies that would perform some function during the course of the experiment. These included:

1. The National Aeronautics and Space Administration (NASA):

The providers of the communications satellite required that experimenters communicate with them about their plans and progress by sending a representative to meetings of a Users Task Force. In return the NASA advisors would provide technical assistance when needed through its engineering group at the Goddard Space Flight Center (GSFC) in Maryland.

2. National Medical Audiovisual Center (NMAC):

A division of the National Library of Medicine, the Atlanta-based facility is comprised of television facilities and personnel, videotape editing equipment and other resources, which were offered at no charge for the VA/ATS-6 Experiment. They were used heavily during the production of preproduced materials for the satellite broadcasts.

3. Appalachian Regional Commission (ARC):

The agency that had originally intended to conduct medical experiments on ATS-6, along with educational and career programming. When the VA offered to conduct medical experiments in Appalachia, ARC offered to fund the evaluation for the project. The agency was forced withdraw this offer and was then invited to send a representative to the VA Experimental Coordination Committee (described below) to continue the dialogue between the VA and ARC.

4. Board of Directors, Foundation for Applied Communications Technology (FACT):

Members of the FACT Board of Directors, who had been involved in the management of the UCLA Medical Media Network and the California Regional Medical Programs, would act in an advisory capacity to the Board President, who would coordinate the experiment.

In addition to these existing groups, one additional committee was formed to advise in program development and topic selection. This was the:

5. Experiment Coordination Committee (ECC):

Representatives were selected from the Veterans Administration Central Office, the ten participating VA hospitals, medical school faculty, ARC, and from the health community of Appalachia. The VACO Project Director would serve as Chairman of the ECC.

6. Hospital Coordinators:

Five individuals from each VA hospital participating in the experiments were asked to perform certain coordinating functions within their hospitals during the course of the experiment. These were: the *Medical Coordinator*, who would represent staff physicians; a *Nursing Coordinator*, who would perform the same function for the nurses and allied health personnel; and *Evaluation Coordinator*, who would collect data and file reports; an *Engineering Coordinator*, who would assist in the installation of the receive-only terminal (ROT) and learn to operate and adjust it, as well as make reports regarding the technical function of the satellite; and a *Communications Coordinator*, who would be in charge of public information, including advertisement of the broadcasts by satellite, both in-house and for the community.

Subcontracts

In addition to liaisons with these committees and agencies, subcontracts were made with four other groups to perform functions during the experiments. These were:

1. The Federation of Rocky Mountain States (FRMS):

Also an experimenter on ATS-6, FRMS had been contracted to design, install, and maintain the ground-based equipment for the satellite. This would include the receive only terminals (ROTs), microwave links needed to augment the satellite transmissions, and access to the ATS uplink terminal at Morrison, Colorado.

2. Applied Communications Research (ACR):

A Stanford University-based group was subcontracted by FACT to perform the formative and summative evaluations of the experimental events. They would interact with the director of experimental design to evaluate events according to certain objectives, and to report formative evaluation results during the experimental period. ACR would make a summative report of the experiment after the final broadcast.

3. David Grieve and Associates:

This San Francisco-based production group would produce films and videotapes on specific program subjects. These preproduced programs would be shown during the live broadcasts via satellite as part of the experimental events. David Grieve *et al.* would also travel to the ten participating hospitals during the teleconsultation events to preproduce case presentations and other material, and to coordinate live slow scan transmissions to Denver, during the teleconsultations.

4. The Medical Media Network (MMN):

The UCLA-based network would distribute selected programs from the ATS-6 experiments for distribution to the 79 continuing members of the VA/MMN.

Needs Assessment

The physician, nursing and evaluation coordinators of the ten participating hospitals were asked to direct the gathering of learning "needs" that would become the basis for satellite programs.

This informal needs assessment was conducted as follows: A list of subjects, compiled as learning needs by the VA/MMN among its participating hospitals, was circulated to the ten Appalachian hospitals. There, the coordinators were asked to have staff members review and update the list, to even discard it if necessary. They generated hundreds of topics, from specific, how-to-do-it surgical techniques, to broader areas, such as the then new problem-oriented medical record. These topics were arranged in order of frequency listed, and the 100 most frequently mentioned became tentative subjects for programs.

The 100 topics were then submitted to the Experiment Coordinating Committee for refinement into subjects, and for recommendations of faculty coordinators for the programs that would be produced on each topic. The list of program subjects was then returned to the coordinators in the ten hospitals. They were asked to survey the physicians, nurses and other appropriate practitioners to ascertain specific information they wanted to have covered during programs on the 89 topics. The list generated for each topic was designated the "User Objectives" for the program and forwarded to the faculty coordinator for inclusion in his plans for the program.

STAGE II: PREPRODUCTION (February 15—June 30, 1974)

A series of activities was undertaken concurrently during this stage of the experiment. Programming decisions were made, transforming the list of subjects into scheduled broadcasts divided among four experimental events. The design of several of these events included preproduced didactic material that would have to be completed prior to the first broadcast,

scheduled for June 1974. Key professional people were to be hired, hospital coordinators informed of their roles during the course of the experiment, and an evaluation plan developed with the Stanford group. All of these activities were accomplished within the designated period and will be described in the remainder of this section.

Video seminars would be used to present "how to" information that could be summarized in a videotape or film, to be followed by question and answer sessions.

Grand rounds would be devoted to clinical case presentations within the broad areas of interest to the practitioners in the ten VA hospitals. Specialists would present their methods of case diagnosis and management; hospital participants could then discuss these cases with the presenters.

Out-patient clinics would be much like the video seminars, but the audience would include patients and their families. For these events, films and videotapes would be used for presenting didactic material.

Teleconsultations would provide an opportunity for physicians and nurses in the hospitals to ask their specific questions of specialists concerning cases they were treating. The subject matter would, therefore, be very general to allow for the specific subject matter that would become pertinent at the time of broadcast.

Decisions of how to divide the programming also were based on the formula for the number of times an event was to occur during the broadcast period: approximately ten teleconsultations (one for each hospital); forty video seminars, twenty grand rounds, and four out-patient clinics. A preponderance of video seminars would be used because this methodology had been most successful in the past for providing continuing education. Two-way grand rounds and seminars for patients and their families were unknown quantities. No one was certain how well audiences for these types of programs would use the two-way satellite linkage.

Production of Software

Once subject matter had been assigned an event category, production of preproduced software could begin. Deciding how to produce this software, under what conditions and using what equipment, was based upon another complex activity that was ongoing throughout the project: selection, utilization, maintenance and, in some cases, design of technical equipment. Many of these decisions were made with the assistance of key staff members. The recruitment and hiring of these individuals was a task that began with the conception of the project and was ongoing into the production phases.

Recruitment of Key Staff Members

The director of experimental design was the first professional staff member to be recruited. She participated in the early planning stages of the experiment, coordinating the needs assessment and working with the project coordinator in designing the experimental events and assigning subject matter to the event categories.

The next step was to find a producer-director who would have the responsibility of coordinating the elements of each satellite program, including the preproduced portions, live lectures and two-way exchanges with the hospitals, and then directing the live broadcasts. Experience in medical television would be important background for this producer-director, who was to have an enormously important role in transforming a list of subjects into interesting, informative television programs.

To find an individual with the necessary talent and resourcefulness to take on this responsibility required nearly a year. The project coordinator asked candidates to produce a videotape on one of the subjects assigned to the video seminar event category. The individual hired as producer-director for the experiment was selected in January, 1974 on the basis of the resulting videotapes.

Once the producer-director had been retained, a search for program moderators, a physician and a nurse could begin. Videotapes of potential moderators in instructional settings, were reviewed at the University of Colorado Medical Center, and a physician-moderator was discovered who had all of the necessary attributes. An Associate Professor of Medicine and a hematologist, he was asked to become the continuing host/moderator, pending arrangements with the University of Colorado, which were eventually agreed upon as satisfactory to all parties. A nurse program moderator also was recruited. One nurse who had background working in a VA coronary care unit as well as other specialized training, was asked to make a videotape test, along with other candidates. She was retained as nurse moderator based upon an agreement with the Veterans Hospital in Denver, where she was an employee.

Another key professional, the production assistant, was hired prior to the first broadcast but was replaced soon after the broadcast year began.

An engineer was hired to travel with the mobile unit that would be used to videotape or film the preproduced didactic material. This arrangement did not work well and the engineer left the project. A second engineer was contracted to travel with the mobile unit during the teleconsultation events.

Involvement and Training of Hospital Coordinators

The hospital coordinators, with their various assignments from engineering and data collection to public information, had the vitally important function of seeing to it that there was someone to react to the experimental broadcasts. Without them, there would have been a communicator with a message but no receiver. Their function of gathering an audience, then collecting audience reactions, was essential to the successful conduct of the experiment. So an in-person, in-house training session seemed not only important but necessary.

To accomplish this training within a reasonable period of time (remembering that the ten hospitals were scattered from Wilkes-Barre, Pennsylvania to Dublin, Georgia in some of the most hard-to-reach portions of the mountainous Appalachian United States), utilizing certain professional people who would be asked to take time from their schedules to be instructors, and for an acceptable monetary cost, it was decided to bring the necessary resource people to each of the ten participating hospitals by chartered aircraft.

The week-long session began on July 12, 1973 at Washington's National Airport. Six individuals participated in the informational exchange and training sessions: the VACO project director, the project coordinator, the director of experimental design, a representative from the Stanford evaluation group, an engineer from the VA Central Office and an engineer from the Federation of Rocky Mountain States. At each hospital, the traveling group met with the five coordinators and other interested individuals, including hospital administrators, technicians, community representatives and faculty members from local teaching institutions. The project director from VACO introduced the group and described the experiment and its legislative basis; the project coordinator explained the specific aspects of the experiment, including what each hospital would be asked to do, the director of

experimental design asked for an updated list of program needs previously requested, as well as some ideas for patient programs and methods of presentation; the representative of ARC met with the hospital coordinator for evaluation, and the engineers from VACO and FRMS met with the hospital engineers to determine sites for the antenna, receiver and monitors, and to discuss other technical aspects of the experiment.

Hospital representatives made some requests; for example, the chief of psychiatry of Salisbury asked for computer-managed programs of psychiatric patients. This request was the basis for selection of the computer program at the Salt Lake City VA Psychiatric Service as an experimental event.

On July 18, when all of the hospitals had been visited, the group went to Atlanta to meet with the experiment coordinating committee at the National Medical Audiovisual Center. It was at that time, that the first categorization of needs into program topics was undertaken and ECC members offered initial suggestions for faculty coordinators.

As the experiment was developed further during the ensuing year, and the numerous specific requirements of the hospital coordinators became apparent, a second information and motivation session seemed essential. Key individuals from each hospital, including the hospital director and coordinators of medical and nursing programs, were invited to participate in a utilization seminar prior to beginning the nine-month broadcast period. The session took place at Cape Kennedy the day before the ATS-6 was launched. During the session, a videotape was presented explaining the project and how each experimental event would be conducted. Evaluation procedures and instruments were circulated for the ten hospitals, hospital posters were passed out which would announce upcoming programs, and participants were invited to ask questions and comment. On May 30, 1974 the hospital representatives watched as the Titan III missile successfully launched the ATS-6.

Evaluation Objectives Designated

Although the primary responsibility for evaluation of the project belonged to the Stanford-based Applied Communications Research group, some interaction was required with the FACT experimenters. This interaction primarily involved the development of the objectives that were to be evaluated for each experimental event.

Objectives for the events varied according to how much pre-planning was possible for each type of program. In the case of video seminars, for example, much pre-planning was accomplished before the program was broadcast. Grand rounds and teleconsultations, on the other hand, could not be rigorously preproduced. Objectives for these events were much more general.

Objectives for the video seminars included: engineering (clarity of the audio and video portions of the signal), utilization (the make-up of the audience expected to participate in the program), knowledge gain (the content of the program as conceived by the faculty coordinator), attitude change expected on the part of the audience, behavior change, and possible patient care outcomes, that might result from professionals participating in the program. These objectives were developed for each video seminar by asking the faculty coordinator to submit objectives prior to beginning work on the production of the software for his program. He was to develop the knowledge gain and other objectives after reviewing the user objectives submitted by his potential audience. The list of objectives for the video seminars were printed, in most cases, in the front of the study guides which supplemented programs for this experimental event.

Objectives for the grand rounds included: engineering, utilization, and whatever subjective responses the evaluation group would be able to gather following these programs.

Objectives for the out-patient clinics included: utilization, knowledge gain, attitude and behavioral changes, among patients and families who viewed the programs.

Objectives for the teleconsultations included: utilization and engineering objectives, including whether or not the slow scan transmissions were technically clear, and whatever subjective responses the evaluators were able to gather.

The computer events and VIDAC would be evaluated for technical results, whether or not signals were transmitted clearly via satellite, and for factors inherent to the material transmitted.

STAGE III: IMPLEMENTATION (July 1, 1974—May 20, 1975)

The first broadcast to the ten hospitals via ATS-6 was to have taken place on July 3, 1974. Before the broadcast year could begin, however, it was necessary to be certain that all linkages with the satellite had been made and were working so that the hospitals could receive a clear television signal. A full facilities test had been scheduled for the Wednesday prior to the first broadcast, but the receive-only terminals (ROTs) were delivered and installed too late for this. So, instead of a full facilities check, an engineering test was made, and significant problems were discovered. All ten of the ROTs had been miswired. The Federation of Rocky Mountain States and Westinghouse (manufacturers of the ROTs) agreed to modify the terminals in time for the July 3 scheduled broadcast, but the VA Central Office did not want to risk assembling hundreds of people for a broadcast that would set the tone for the entire experiment without ascertaining that they would receive a clear signal. A facilities check was scheduled for July 3, 1974.

During the demonstration, television signals were broadcast from the KMGH-TV studio in Denver, via ATS-6, to the ten receivers at the VA hospitals in Appalachia. The participating hospitals were asked to telephone the Denver studio on a five-line conference call, according to Network (Red and Green), as soon as they were instructed to do so. All ten reported they were receiving both video and audio signals clearly, although Wilkes-Barre's signal was weak, probably because the hospital was located on the fringe of the foot-print receiving area. Beckley reported a "snowy" picture at times, probably due to problems with the cable in their building. Beckley's engineer thought the problem could be resolved by the following week. All ten of the hospital engineers had one common complaint: they had not had enough time to receive full signal strength before going on the air. They must have an additional 15 minutes prior to broadcast to align their antennas and attempt to get full signal strength the following week.

The push-to-talk telephones presented some initial difficulties. These telephones, which linked the hospitals with the Denver studio, were equipped with a switch that would cut out the audio from the television receivers in the room when a physician or nurse wished to talk to Denver. This eliminated the distraction of the person speaking into the telphone and then hearing himself come back over television a half second later. The drawback was that, unless the individual on the telephone spoke very loudly, the rest of the audience in the room with him could not hear his question. In some hospitals, public address systems were set up near the telephone to carry the

speaker's questions and comments while the switch cut out the television audio. In some other hospitals audiences complained throughout the experiment that they could not hear questions from their own audience.

The facilities demonstration was felt to be very successful technically despite these minor problems. The satellite was functioning as expected; the signals were clear (better than on home sets, some participants said) and the VA and FACT coordinators of the experiment felt they were ready to begin the regular broadcasts.

The Implementation stage of the experiment began on July 10, 1974 with the first broadcast to the ten VA hospitals via ATS-6. The five experimental events and how they were accomplished will be described in subsections in the remainder of this section.

1. VIDEO SEMINARS

The video seminars were to be comprised of didactic material presented on film or videotape, followed by, or interspersed with, two-way discussions between faculty in the studio and participants in the ten VA hospitals.

Preproduction of Video Seminars

The first step was to select a faculty coordinator for the program. The requirements for a faculty coordinator included: recognition by colleagues for expertise in the program subject, ability to instruct and interact with an audience using the television medium, and interest in participating in the experiment. Faculty coordinators were suggested by the Experiment Coordinating Committee, by other specialists in the subject area, and by the continuing program moderators, who were familiar with the abilities of colleagues in the Denver area. Because Denver had a concentration of medical specialists, well recognized in their subject fields throughout the United States, it was an excellent source of faculty. The proximity of these individuals proved convenient in developing program materials and methodologies, and so about 50 percent of the program faculty for the experiment were from the Denver medical community. The other 50 percent of the faculty came from medical centers and other facilities throughout the country.

Once a faculty coordinator had been selected and had agreed to work on a program, he was asked to write a three-to-four-page paper or essay on the subject area for his program. This would be the basis both for the television portion of the program, and for the study guide that would be sent to the hospitals prior to the program broadcast. The paper would cover the information requested in the "user's objectives" defined by the hospital participants, who would be the program audience. It would also cover the knowledge gain and other objectives the faculty coordinator believed to be important to bring the audience up-to-date in the subject.

Study guides. All of the video seminars were to be supplemented by study guides, which would include the objectives for the program, a bibliography, relevant articles, and in many instances graphic material that could not be used on the televised program because it was too complicated, or else graphic material that was so germane to the topic that printed copies would be useful permanent materials for the audience participants.

Films and videotapes. The project coordinator set a goal to record as much of the preproduced program material as possible on videotape rather than on 16mm film. The reason for this was his belief that film sets up a "barrier" between screen action and the audience while videotape achieves virtually the same feeling of presence as does a live television broadcast.

The feeling of presence was a particularly important aspect in all of the experimental events. Several physicians in the ten participating hospitals had mentioned their concern that they would not be able to relate to a consultant over television with the same degree of confidence and ease with which they could talk with someone in person. An objective of the experiment was to dissolve the barrier of the television screen as completely as possible, and retaining the live quality of television as opposed to film seemed to be one step toward accomplishing this.

The preproduced didactic inserts for the video seminars therefore were to be recorded on videotape. The mobile production unit, which would travel among various field locations to make these preproduced videotapes, was to be equipped with a portable television camera and other equipment that would make it possible to record programs on one-inch helical scan tape, in color. The one-inch tape could then be transferred to quadraplex tape for editing and broadcast. The equipment required, however, was not available by the time preproduction was scheduled to begin (a year before the satellite was launched), and so for the first part of the production season, film had to be used. Later, as electronic equipment did become available, videotape replaced film for the preproduced software.

Not all of the films and videotapes used for the didactic portions of the video seminars were produced exclusively for the ATS-6 experiment. In some instances, pre-existing software was used.

Once the preproduced material was ready, including graphics and slides as well as the films and videotapes, and the study guide had been edited, printed and sent to the hospitals, work on the live portion of the broadcast began. The faculty coordinator and other participants traveled to Denver the day before the broadcast. Additional inserts for the program might be videotaped that afternoon, and any charts or graphics that had not been completed and photographed for slides were prepared by an artist. The program was rehearsed and participants informed of when and where to be the next day.

Video Seminar Broadcasts

On the day of the broadcast the faculty coordinator and other participants were expected to arrive an hour before the program went on the air. During this hour, last minute arrangement of visuals and other materials could be made, and the participants were made-up for television and given microphones. Fifteen minutes prior to air time, the satellite was pointed toward Appalachia and color bars and music were broadcast so that the hospital engineers could check receivers for audio and visual signal strength and clarity. Five minutes before air time a camera was focused on a person on the set so that receivers could be adjusted for skin color. At precisely 1:00 p.m. EDT (EST later in the year) the program began.

Following a standard opening sequence, the physician or nurse moderator would introduce the subject and faculty for the program, and the preproduced portion would be shown. The intent was to provide some commonality and a base for initiating live discussion and questions. The two networks, Red and Green, were invited alternately to telephone in with their contributions.

In most instances the video seminar was an hour long and was followed by another event, either a second video seminar, or grand rounds, or an out-patient clinic. After the two-hour broadcast, representatives of the viewing audiences in the

hospitals were telephoned for a quick evaluation of the two events. This "instant survey" was to gather formative information regarding technical clarity of the signal, as well as acceptance of the programs themselves.

Most of the 37 video seminars produced during the broadcast season followed this pattern fairly closely. Some exceptions were: two remote broadcasts, one from a coronary care unit in a hospital, the second from a rehabilitation center; one variation in which the preproduced videotape was copied and sent to each of the ten hospitals prior to broadcast, so that only live programming was presented during the broadcast period on the satellite; and one instance in which a preproduced program was broken into segments and live two-way discussion invited between each segment.

Some occurrences and reactions to the video seminars will be reported in **Section IV: Observations.**

2. GRAND ROUNDS

Grand rounds were to be based upon case presentations within a general subject and would not, therefore, be as prestructured as video seminars. Faculty coordinators were given the program subject, user objectives for the subject and asked to present a current relevant case, or cases, using visual materials, such as laboratory findings.

The faculty coordinator and other program participants arrived the day before the grand rounds event and went through the material they would present. Last minute work was done on any visuals that might be conceived during this rehearsal, and some inserts might be videotaped.

The day of broadcast, the faculty arrived an hour before air time for last minute instruction, make-up and microphone placement. The moderator introduced the faculty participants and the case presentation was made. Live questions and answers followed, and were interspersed with live discussion among the faculty in the studio and more didactic material.

Seventeen grand rounds were presented during the experiment.

3. OUT-PATIENT CLINICS

The out-patient clinics were much like the video seminars in format, but they were not supplemented by study guides. The goal was to provide patients and their families with information needed for home care or rehabilitation of their particular illness. Faculty coordinators for these events were specialists in their subject areas. They were informed that their audience would be patients and families, rather than professionals, and so they should gear their presentations accordingly. Rehearsal for the out-patient clinics followed much the same routine as for video seminars and grand rounds. Three out-patient clinics were presented during the experiment period.

4. TELECONSULTATIONS

The teleconsultation events were to be hospital originated, with the studio specialists on the receiving end rather than being the presenters of material. A great deal of field production, therefore, was required prior to each hospital's program.

Another special feature of the teleconsultations was the slow scan method of sending visual information from the hospitals to the studio on the day of broadcast.

Preproduction of Teleconsultations

The Wednesday prior to the teleconsultation, the mobile unit would begin traveling to the originating hospital and would arrive on Thursday. In many instances production of the case presentations would begin then and continue over the weekend and through Monday, when the finished videotaped case presentations were sent air express from the nearest large airport to Denver. During Tuesday and early Wednesday the still visuals to be sent over the slow scan system would be planned.

Each teleconsultation event was based upon a subject the participating hospitals had listed as an area in which they desired consultation with specialists. The originating hospital for the teleconsultation selected a subject that was considered to be a speciality in that institution, usually owing to the large number of cases treated in the area. The concept was for the hospital participants to present current cases, including related visuals such as roentgenograms, electrocardiograms and various types of scans, and then receive consultations from the specialists in the Denver studio relating to diagnosing or managing the case.

The slow scan process. Throughout the teleconsultation events, the slow scan process selected for the experiment would be tested in many ways.

The particular system used, developed by Colorado Video, Inc., was comprised of a television camera, a slow scan transmitter with a telephone data coupler, a specially ordered telephone line, and a device at the receiving end for reconstructing the "bits" and scanning the information, line by line, to reform the still image on a television screen. Also included in the system was a disc storage device that could store 27 black-and-white images and one color image. This meant that 28 still pictures could be sent prior to broadcast time to be retrieved, instantly, from the storage disc when needed.

In addition to testing whether this system could be used for medical purposes, such as diagnosing X-rays and histograms—evaluations that had been made in previous experiments (described in Section II)—this system would be tested for its ability to transmit usable color visuals, a test that had never been made within a medical context until the VA/ATS-6 experiment.

Broadcast of Teleconsultation Events

On the day of the teleconsultation broadcast, the faculty specialists would arrive about half an hour prior to air time for make-up and microphone placement. They were not briefed in any way, in most instances, for what they would be discussing, except for being informed of the general clinical area that would be the program's topic.

They would view the case presentations, made on videotape at the hospital and sent to the Denver studio, as it was shown over the satellite. The originating hospital then participated in a live discussion, and the other nine hospitals were invited to contribute if they wished to do so.

Ten teleconsultations were presented during the experimental period.

The following table is a listing of all programs broadcast during the VA experiment on ATS-6.

TABLE I
VA/ATS-6 SATELLITE EXPERIMENT
PROGRAMS BROADCAST 7/10/74 through 5/20/75

	Program Title	Participants
7/10	40,000 Country Miles Open Discussion	David E. Caldwell Roger Hamstra Peggy Mathis Robert B. Shamaskin
7/10	Anemia Video Seminar—M.D.	Roger Hamstra Stephen Wallner, M.D.
7/17	Problem Oriented Medical Record Video Seminar—All Disciplines Two-Hour Program	Roger Hamstra James Crutcher, M.D.
7/24	Acute Upper G.I. Bleeding—M.D. Grand Rounds—M.D.	Roger Hamstra J. Edward Berk, M.D. Burton H. Smith, M.D. Fred Kern, M.D. Gilbert Hermann, M.D. Samuel Caruthers, M.D.
7/24	Acute Upper G.I. Bleeding—R.N. Grand Rounds—R.N.	Peggy Mathis RoseMarie Hale, R.N. Janet Velazques, R.N. Judy Goodhart, R.N.
7/31	Changing Role of the Nurse, Part I Video Seminar—R.N.	Peggy Mathis Nancy Hynson, R.N. Robert Bradley, M.D.
7/31	Acute and Chronic Renal Failure Grand Rounds—M.D.	Roger Hamstra Robert Contiguglia, M.D. Melvin Klein, M.D. John Conger, M.D.
8/7	The Management of Commonly Occurring Arrhythmias Video Seminar—M.D.	Roger Hamstra Paul Walter, M.D. William Nelson, M.D. Hywel Davies, M.D.
8/7	Arrhythmias Video Seminar—R.N.	Peggy Mathis Paul Walter, M.D. Shirley Hoffman, R.N. Joan Bullas, R.N.
8/14	Changing Role of the Nurse Part II Video Seminar—R.N.	Peggy Mathis Barbara Eckert, R.N. Ethel Hicks, R.N.
8/14	Maintenance of Venous and Arterial Cannulas Video Seminar—R.N.	Peggy Mathis Wanda Avery, R.N. Nancy Hutchings, R.N.
8/21	Alcoholism Rehabilitation Grand Rounds—R.N., LVN, NA, PSYCH, SW	Roger Hamstra Gene Moody Joseph Duetsch, M.D. John Buckman, M.D.
8/21	The Problem Drinker Outpatient Clinic—Patients/Families	Peggy Mathis John Mogen, M.D. Marybelle Fisher, MSW
8/28	Changing Role of the Nurse Part III Video Seminar—R.N.	Peggy Mathis Lois Morgan, R.N. Ann Trageser, R.N.
8/28	Family Therapy Video Seminar—M.D., R.N., PSYCH., SW	Roger Hamstra Ian Alger, M.D. Kitty LaPerriere, Ph.D.

	Program Title	Participants
9/4	Death, Dying and Grief Video Seminar—R.N., LVN, NA, SW, PSYCH Two-Hour Program	Roger Hamstra Peggy Mathis Lewis Picher, Ph.D. John DeHaan, M.S.W. Carol Alexander, R.N., M.S.
9/11	Pulmonary Embolism Video Seminar—M.D., R.N.	Roger Hamstra Arthur Sasahara, M.D. Joan Fitzmaurice, R.N.
9/11	Changing Role of the Nurse Part IV Video Seminar—R.N.	Peggy Mathis Barbara Eckert, R.N.
9/18	The Diabetic Patient Outpatient Clinic—Patients/Families	Peggy Mathis L. Mae McPhetridge, R.N.
9/18	Surgical Treatment of Peptic Ulcers Grand Rounds—M.D., R.N.	Roger Hamstra Robert S. Brittain, M.D. Allan B. Kortz, M.D. Peter H. Baker, M.D.
9/25	Behavior Modification Techniques Grand Rounds—R.N., PSYCH, SW Two-Hour Program	Roger Hamstra Peggy Mathis Ogden R. Lindsley, Ph.D. Ray Beck Sandy Dinkins, M.A. Claudine Paris, B.A.
10/2	Changing Role of the Nurse, Part V Video Seminar—R.N. Two-Hour Program	Peggy Mathis Virginia Longest, B.S.N., M.A. Barbara Eckert, R.N. Ethel Hicks, R.N. Nancy Hynson, R.N. Ann Trageser, R.N.
10/9	Coronary Arteriography Video Seminar—M.D., R.N.	Roger Hamstra Timothy Takaro, M.D. Philip Oliva, M.D.
10/9	Chronic Obstructive Pulmonary Disease Grand Rounds—M.D., R.N.	Roger Hamstra Ann Brookens, B.S.N., A.R.I.T. James H. Ellis, Jr., M.D. Richard Matthay, M.D. Shirley Pfister, B.S.N.
10/16	Cardiopulmonary Resuscitation Video Seminar—All Disciplines	Roger Hamstra Archer Gordon, M.D., Ph.D. A. James Lewis, M.D. Kevin M. McIntyre, M.D., J.D. Leonard Scherlis, M.D.
10/16	Problem Oriented Medical Record Video Seminar—R.N.	Peggy Mathis Corrine Cherpak, R.N. Sondra Ferguson, R.N.
10/23	Genital Urinary Infection Grand Rounds—M.D., SURG, R.N.	Roger Hamstra Marc LaForce, M.D. Gale Adair, R.N., B.S.
10/23	Biofeedback Video Seminar—All Disciplines	Roger Hamstra Richard N. Filer, Ph.D.
10/30	Coronary Care Unit—Remote Video Seminar—CCU R.N., LVN, NA, ADMIN. Two-Hour Program	Peggy Mathis—on location with Shirley Hoffman, B.S.N. Sharon Palmer, R.N. Roger Hamstra—in studio with Dennis Battock, M.D. Paula Huska, B.S.N. Sidney Smith, Jr., M.D.

	Program Title	Participants
11/6	Cardiac Rehabilitation Video Seminar—M.D., R.N., LVN, N.A.	Roger Hamstra L. Loring Brock, M.D. Joe Acker, Jr., M.D. Ned H. Cassem, M.D. Frann Mount, R.N., B.S.N.
11/6	*Cardiac Rehabilitation* Outpatient Clinic—Patients/Families	*Peggy Mathis* L. Loring Brock, M.D. Ned H. Cassem, M.D. Frann Mount, R.N., B.S.N. Gordon Titus—Patient
11/13	Hypertension Video Seminar—All Disciplines Two-Hour Program	Roger Hamstra Edward D. Freis, M.D. Thomas B. Gottlieb, M.D. Sally Shaughnessy, R.N.
11/20	Wilkes-Barre, Pa. Teleconsultation Silicosis M.D. Two-Hour Program	Roger Hamstra Charles J. Bishop, M.D. Raymond L. H. Murphy, M.D. Neal Goodman, M.D. Dennis Waite, M.D.
11/27	Altoona, Pa. Teleconsultation Histopathology M.D. Two-Hour Program	Roger Hamstra Paul J. Kadull, M.D. James J. Bergin, M.D. Morgan Berthrong, M.D. Thomas E. Starzl, M.D.
12/4	Clarksburg, W. Va. Teleconsultation Cardiovascular Surgery M.D. Two-Hour Program	Roger Hamstra Reverdy H. Jones, M.D. William G. Rainer, M.D. Theodore R. Sadler, Jr., M.D. James N. Wolff, M.D.
12/11	Beckley, W. Va. Teleconsultation Radiology M.D. Two-Hour Program	Roger Hamstra William E. Christie, M.D. Donald Fink, M.D. Stanley B. Reich, M.D. John F. Roberts, M.D.
12/18	Salem, Va. Teleconsultation Problems in Access to Circulation in Dialysis M.D., R.N. Two-Hour Program	Roger Hamstra William Reefe, M.D. Jorge Roman, M.D. Anne Bobal, B.S.N. Kenneth Cotton Gary Lum, M.D. Melvin M. Newman, M.D.
	Christmas and New Year's Holidays	
1/8	Mt. Home, Tenn. Teleconsultation Cardiac Arrhythmias M.D., R.N. Two-Hour Program	Roger Hamstra Lyman A. Fulton, M.D. Henry L. Brammell, M.D. Shirley Hoffman, R.N. David Shander, M.D.
1/15	Asheville, N.C. Teleconsultation Problems of the Geriatric Patient—M.D., R.N.—2-hr. prog. (First hour of program relinquished for President Ford's State of Union address so Gov. of Alaska could receive it)	Roger Hamstra Peggy Mathis Curtis Crump, M.D. Jackie Avery, R.N. James C. Folsom, M.D. William A. Hines, M.D.

	Program Title	Participants
1/22	Salisbury, N.C. Teleconsultation Nursing Care in Long-Term Illness—M.D., R.N. and continuation of the Asheville Teleconsultation Two-Hour Program	Roger Hamstra Peggy Mathis Ruby Miller, R.N. Curtis Crump, M.D. Lee Bowles Jean Hayter, B.S.N., M.A., Ed.D. William A. Hines, M.D. Margaret Kersenbrock, B.S.N. Jessica Stone, R.N.
1/29	Fayetteville, N.C. Teleconsultation Pancreatitis M.D., R.N. Two-Hour Program	Roger Hamstra George F. Cameron, Jr., M.D. John O'Hale, M.D. Samuel Caruthers, M.D. Lawrence Norton, M.D. John W. Schaefer, M.D. Peggy Mathis Rosemarie Hale, R.N., M.S.N. Marcheta Hecko, R.N. Janet Velazquez, R.N., M.S.
2/5	Dublin, Ga. Teleconsultation Pulmonary Diagnostic and Therapeutic Problems—M.D. and Speech Therapy—R.N.	Roger Hamstra Robert F. Proctor, M.D. Maj. Dennis M. Chalus, M.D. Col. Roald A. Nelson, M.D. Col. Tracy E. Strevey, M.D. Peggy Mathis Beverly K. Hagemann, R.N. Nick McNeil, M.A. Thomas Prescott, Ph.D.
2/12	Solitary Pulmonary Nodule Grand Rounds—M.D., R.N.	Roger Hamstra D. Boyd Bigelow, M.D., F.C.C.P. David E. Hutchison, M.D. Neal Goodman, M.D.
2/12	Pre-Op and Post-Op Thoracotomy Care Grand Rounds—R.N., LVN, NA	Peggy Mathis Sharon A. Palmer, R.N. Katherine Williams, R.N.
2/19	Blood Gasses Video Seminar—R.N.	Peggy Mathis Marilyn Flood, R.N., M.S. David C. Levin, M.D. Chris Tanner, R.N., M.S.
2/19	Neurological Diagnostics Grand Rounds—M.D., R.N.	Roger Hamstra Michael Cherington, M.D. James A. Lewis, M.D. John C. Stears, M.D.
2/26	Oral Cancer Detection Grand Rounds, DDS, R.N., LVN	Roger Hamstra John L. Hicks, D.D.S. Richard Delo, D.D.S., M.S.
2/26	Antibiotics in Urinary Tract Infection Video Seminar—M.D. R.N.	Roger Hamstra R. Russell Martin, M.D. Gladys Chelgren, R.N., M.S.N. L. Barth Reller, M.D.
3/5	Psychotherapeutic Drugs Grand Rounds—M.D., R.N., PSYCH. SW	Roger Hamstra Leo E. Hollister, M.D. Thomas J. Crowley, M.D. Wallace LaBaw, M.D.

	Program Title	Participants
3/5	Fiberoptic Endoscopy Video Seminar—M.D., or Team	Roger Hamstra William I. Wolff, M.D. Barry W. Frank, M.D. Thomas A. Witten, M.D.
3/12	Schizophrenia Video Seminar—PSYCH, M.D.	Roger Hamstra Thomas J. Crowley, M.D. Anne McLean, R.N., B.S. Paul Polak, M.D.
3/12	Cirrhosis Video Seminar—M.D., R.N.	Roger Hamstra Hyman J. Zimmerman, M.D. Judith Goodhart, R.N., M.S.N. Thomas A. Witten, M.D.
3/19	Heart Sounds Grand Rounds, M.D., R.N.	Roger Hamstra Lane Craddock, M.D. Shirley Hoffman, R.N.
3/19	Acute Respiratory Failure Video Seminar—M.D., R.N.	Roger Hamstra Joseph H. Bates, M.D. Richard Matthay, M.D. Judith Tietsort, R.N., A.R.R.T.
3/26	Cancer of the Colon Grand Rounds—M.D., R.N.	Roger Hamstra Robert E. Gerner, M.D. F. Bing Johnson, M.D. George E. Moore, M.D. Richard M. Mulligan, M.D.
3/26	Care of the Colostomy Patient Video Seminar—R.N., LVN, NA	Peggy Mathis Norma N. Gill, E.T. Joan Kerr, R.N., E.T. Vicki Jensen, R.N., E.T.
4/2	Care of the Chronic Lung Disease Patient Video Seminar—M.D., R.N., LVN	Peggy Mathis Marilyn Flood, R.N. Shirley Pfister, B.S.N. Judith Tietsort, R.N., A.R.R.T.
4/2	Tracheostomy Video Seminar—R.N., LVN	Peggy Mathis Shirley Pfister, B.S.N. Marilyn Flood, R.N. Judith Tietsort, R.N., A.R.R.T.
4/9	Cardiac Catheterization Video Seminar—M.D., R.N. First Hour was relinquished to Radio Astronomers in the Applachian Region at the request of NASA	Roger Hamstra Paul D. Stein, M.D. Kathleen Donnellan, R.N. Sidney C. Smith, Jr., M.D.
4/16	Stroke Rehabilitation—Remote Video Seminar—R.N., LVN, PSYCH, SPEECH THERAPIST Two-Hour Program	Roger Hamstra Peggy Mathis James C. Warren Barbara Boutell, O.T.R. Enid Maxwell, R.N. Michael Shaffer, M.S.W., A.S.C.W. James Svoboda, M.A. Charles Szmczak, R.P.T.

	Program Title	Participants
4/23	Quality Assurance in Nursing Video Seminar—R.N. Two-Hour Program	Peggy Mathis Virginia Longest, B.S.N., M.A. Joan M. Gratz, R.N. Marie J. Zimmer, R.N., M.S.N.
4/30	Management of Unstable Angina Video Seminar—M.D., R.N.	Roger Hamstra Stewart M. Scott, M.D. Robert A. Chahine, M.D. F. Maxton Mauney, Jr., M.D. John H. Russell, M.D.
4/30	The Selection and Use of Wrapping Materials for Sterilization Video Seminar—Central Supply, R.N., O.R.	Roger Hamstra John Cobis Frank Mussoni
5/7	Problem Oriented Medical Record Update Video Seminar—All Disciplines Two-Hour Program	Roger Hamstra James Crutcher, M.D. Sondra Ferguson, R.N.
5/14	Ultrasonics in Cardiology Video Seminar—M.D., R.N.	Roger Hamstra Arthur E. Weyman, M.D. Sonia Chang, B.A.
5/14	Suicidal Patient Grand Rounds—R.N., LVN, NA	Roger Hamstra Norman L. Farberow, M.D. Fred Loya, M.A.
5/20	Attitude Therapy and Treatment of Depression Video Seminar—M.D., R.N., PSYCH	Roger Hamstra James C. Folsom, M.D. Suzanne Dozier, R.N. Lewis Picher, Ph.D.
5/20	Retrospective: The VA Satellite Experiment Open Discussion—All Disciplines	David E. Caldwell Robert B. Shamaskin

5. COMPUTERIZED EVENTS

Once two programs had been selected to be computer events on the satellite, the major activity of establishing interfaces between computer, satellite and hospitals was accomplished by the two coordinators for these events: the Biophysics Department of the University of Utah College of Medicine, located at the Latter Day Saints Hospital; and the Psychiatric Service of the Veterans Administration Hospital. Both of these facilities are located in Salt Lake City, Utah.

Selection of Participants

The two Appalachian VA hospitals selected to participate in the clinical decision-making program (of the Biophysics Department, University of Utah) had expressed an interest in having their nurses participate in the computer-assisted training. Fayetteville evidenced the most interest and was selected to test the program using traditional telephone lines, 24 hours a day, for the program validation period, then for two-and-a-half hours on Wednesdays during the test period on ATS-6. Altoona was selected to participate via satellite linkage.

Salisbury was selected to participate in the patient-self-assessment program (of the Salt Lake City VA Psychiatric Service) because the request for a computer-managed program had come from that hospital. The doctor who requested the program was asked to coordinate the event at the receiving end.

Engineering

The computerized events were primarily engineering experiments to compare satellite linkages with traditional telephone connections between computer and CRT. The interface with the satellites presented the most difficulties in conducting these events.

Implementation of Computerized Events

The implementation of both computer events was delayed by a federal regulation then pending and about to become law. The legislation was intended to protect individual privacy, and the time required to write letters certifying how patient identity would be protected during the exchange between Salt Lake

and Salisbury delayed the beginning of all computer experiments for two weeks.

On December 10 a test was made at the Goddard Space Flight Center of the computer signal transmitted through ATS-3 and 6. The engineers reported the lines were unclear. It appeared unlikely that both Altoona and Salisbury could transmit signals via ATS-3 simultaneously because the satellite was operating on half power only. The December 10 test indicated that the signal transmitted through both satellites (3 and 6) was usable by at least one transmitter at a time, however, and the decision was made to continue with the two experiments as planned until success or failure could be determined.

The Fayetteville Tests. The computer terminal scheduled for use at Fayetteville was damaged in transit, which resulted in a second delay of the experiment. The linkage with the computer via telephone line was established in mid-January, and except for a two-week period during which the telephone line was inadvertantly disconnected, the nurses at Fayetteville had access to the clinical decision-making program 24 hours a day for two months. During that time, 16 individuals logged time on the computer and ran a total of 94 cases.

The Altoona Tests. On January 15, 1975, the first ATS-6 and 3 mediated computer events were attempted with Altoona. ATS-6 carried the signal well to Altoona, but apparently the 90-watt Altoona transmitter was not sufficiently powerful to return a clear signal.

The satellite connection via ATS-6 and 3 was attempted seven times during the VA's broadcast period on ATS-6. During these attempts the connection was maintained successfully only once for the entire two hours. The other six attempts were not successful for various reasons: the computer broke down on one occasion and once the telephone company inadvertantly disconnected the line between Salt Lake City and Denver. On the four remaining days, reception of the signal via ATS-3 from Altoona was marginal to poor, and the program was operative only for about ten minutes each day (Table II).

TABLE II COMMUNICATIONS LOG
Salt Lake City to Altoona Via ATS-3 and ATS-6

Date (1975)	Comment
January 15	Communications via ATS-3 unreliable. Land link via telephone established to replace ATS-3. Communications via ATS-6 very good.
January 29	Able to run only for the last 10 minutes due to a bad receiver at NCC in Denver.
February 5	Both links (ATS-3 and ATS-6) functioned well for the entire two hours.
February 12	VA Hospital at Salisbury, North Carolina also using ATS-3 and ATS-6. Interfered with communication between Altoona and Salt Lake City. Able to run for only 10 minutes when Salisbury shut down their transmitter.
February 19	Phone lines between NCC in Denver and LDS Hospital in Salt Lake City disconnected by phone company. No run time.
February 26	Video terminal at Altoona inoperative. No run time.
March 5	Signal from Altoona via ATS-3 modulated by local radio station in Altoona. No run time.

As predicted, the problem was primarily with ATS-3. The one day the program was operative over this satellite, the 90-watt transmitter was used to return the signal from Altoona, so the problem was not entirely with this part of the system. The engineers rated the signal from the ATS-6 as "clear" and "entirely adequate."

The Salisbury Satellite-mediated events. The patient self-assessment program was initiated at Salisbury on January 22. The test was not successful because the data sets ordered for Salisbury were not compatible with the telephone lines being used.

Other problems interfered with a successful transmission of the return signal from Salisbury until March 5. Transmission was successful on March 12. Then, on March 19 the telephone line from Salt Lake City to Denver was again inadvertantly disconnected by the telephone company. Two more hours of patient self-assessment were accomplished on April 2, and on 9, 16 and 23, except for one hour when the satellite was not available to the VA/ATS-6 experiment. (Table III.)

TABLE III
SALT LAKE-SALISBURY SATELLITE COMMUNICATION EXPERIMENT
FINAL REPORT
January 22, 1975 to April 23, 1975

1/22 to 1/28 The first transmission was planned on 1/22 with Terry Ahnstedt in Salisbury to assist. We discovered that the data sets in Salt Lake and Salisbury were not compatible with the phone lines being used. We corrected the problem in Salt Lake, anticipating transmission on 1/29.

1/29 to 2/4 The telephone company had still not provided the data set in Salisbury. To avoid another possible delay, we found an appropriate data set in Salt Lake City and shipped it air freight to Salisbury. When the phone company's data set had still not arrived. Salisbury engineering installed the one we had provided for them.

2/5 to 2/11 Communications were not established on 2/5 due to either problems with the satellite or lack of adequate amplification to the signal arriving from ATS-3 at Denver. The problem was finally isolated at Denver. Corrective action consisted of one hour testing with all points involved using ATS-3 only. This effort continued for several days until NASA suggested that Denver work full time on their own to solve the problem.

2/12 to 2/18 During transmission time, Denver conducted tests to investigate suspected interference between Altoona and Salisbury. They informed us that both stations could not be run simultaneously because of a transmission power difference between the Salisbury transmitter and the Altoona transmitter.

2/19 to 2/25 Denver solved the amplification problems. We achieved approximately one hour of successful communications with Salisbury.

2/26 to 3/4 On 2/26 we were informed that the LDS-Altoona link would receive the entire two hours of satellite time. Thus, no transmission occurred to Salisbury.

3/5 to 3/12 On 3/5 we completed two full hours of patient testing.

3/12 to 3/18 The LDS-Altoona experiment was discontinued. We completed two full hours of patient testing.

3/19 to 4/1 When we attempted to transmit on 3/19, we discovered that the phone line from Salt Lake City to Denver had been disconnected. There was apparently some confusion on the part of AT&T in Washington between extension and disconnection of the line. The order to disconnect was issued by AT&T in Washington. In the ensuing debate AT&T accused the Salt Lake City VA of an FCC violation because we had a non-AT&T data set on the line. AT&T claimed that they disconnected our line because of this alleged violation. However, AT&T found this data set when disconnecting the phone line.

Russ Condy of Mountain Bell had made the suggestion at the beginning of the project that we use our own data set on the line. He made the suggestion because AT&T would have difficulty billing for a Mountain Bell data set attached to a phone line ordered by AT&T in Washington. We followed his recommendation.

4/2 to 4/23 We ran two hours of patient testing each Wednesday, except for a one-hour period in which the satellite was not available.

Ronald A. Giannetti, Ph.D.

As the NASA engineers had predicted, Altoona and Salisbury could not transmit simultaneously over ATS-3

6. VIDAC

Programs transmitted over ATS-6 for the VIDAC experiments were selected after discussions with the Chief of the Medical Service and directors of continuing education and in-service training at the VA Hospital in Dublin. The selection was also based upon the lesson materials available at the National Medical Audio Visual Center (NMAC). Three broad categories were designated: cardiology, transfusions and PH regulation. Programming in these categories would be provided weekly for ten weeks (November 20, 1974 through February 5, 1975) during two minutes of transmission time over the satellite. The target audience was to include physicians, nurses, nurses assistants, dietitians, laboratory technicians and technologists.

Previous studies had indicated the effective compression ratio for combined audio and still-frame visual material was 240:1. Average program length of the NMAC materials was about 20 minutes. The two-minute transmitting time would therefore allow a maximum of 24 programs to be sent in compressed form to the Dublin facility. There they would be recorded on videotape, the visuals in still pictures, the audio in real time, so that when played back the programs would resemble slide-tape programs.

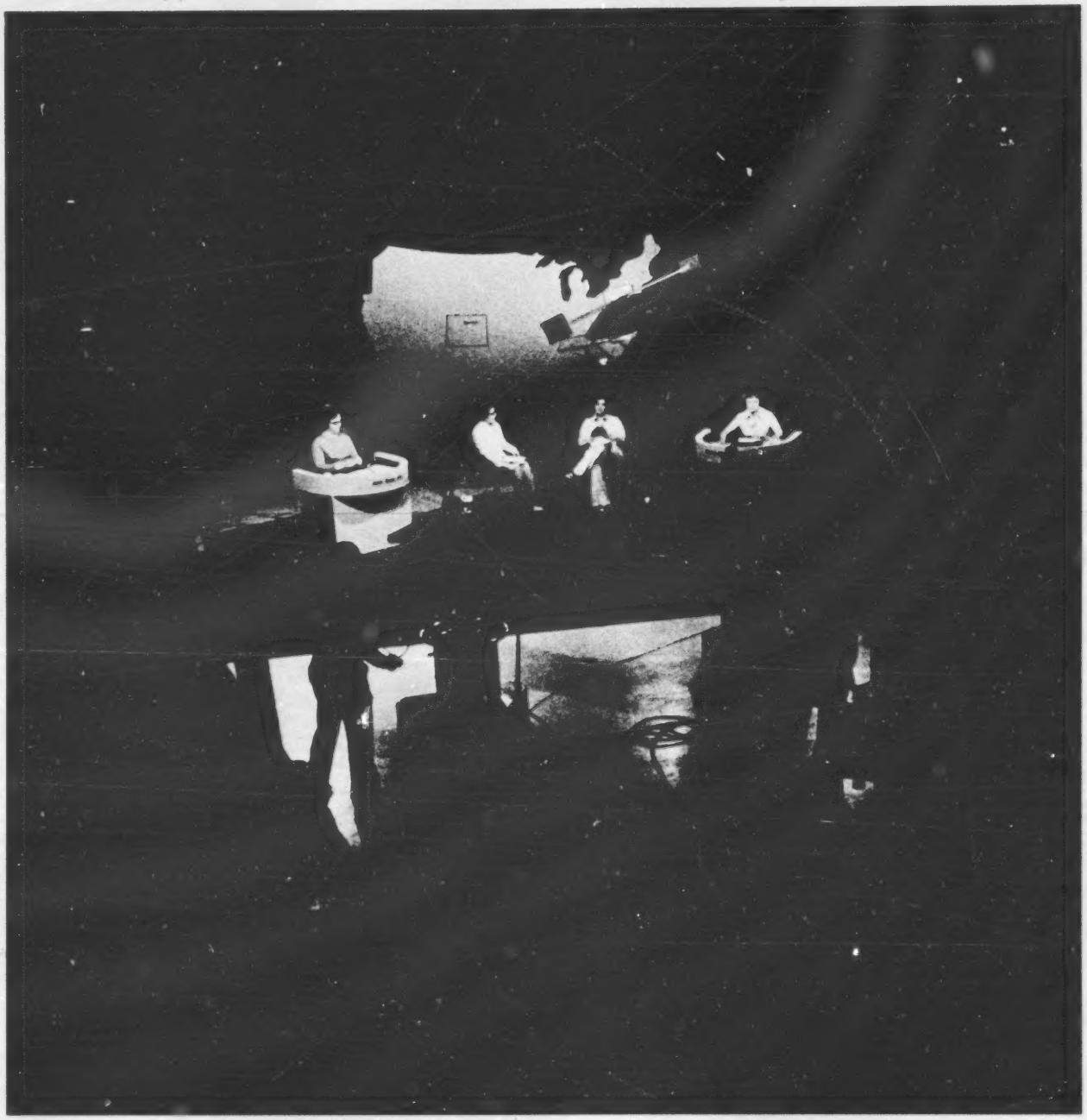
It was found that 33 program titles would be appropriate in the general categories selected by the Dublin VA. These were divided into two groups of 17 and 16 programs. Only one library could be transmitted during the time allowed each week, and the selection of which it was to be was based upon the number of programs requested by participants at Dublin. The group containing the greatest number of requested programs was transmitted.

In the Dublin facility, users could select the programs they wanted to see on conventional color television receivers used to display the programs in real (expanded) time. A catalog of available programs was to be provided for potential users. A log of program requests would be maintained by the audio-visual technician for the hospital, and this log would be supplemented by anecdotal material for the evaluation of the experiments.

Other than transmitting the programs supplied by Westinghouse, FACT and the Veterans Administration Central Office had no participation in the VIDAC events.

SUMMARY

The response to these experimental events varied from program to program, and from hospital to hospital. The project's designers and producers viewed programs as successes or failures for several reasons, but largely based on the apparent immediate reaction of the audience. The total VA/ATS-6 experiment as viewed by the experimenters will be considered in the next section: **Observations.**



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Section IV:
Observations

The observations in this section are made from the point of view of the experimenters: that is the individuals who designed, produced and directed the programs broadcast during the VA Experiment on ATS-6. Their concern was with how programs were received. Could audiences hear and see clearly? Were faculty coordinators interesting to them? Did people stay for the whole program? Did they ask questions—or at least want to? And perhaps most importantly, what course should be taken in future experimentation on behalf of the Veterans Administration with communications by satellites?

The observations in this section are not based upon the formal evaluation efforts contracted to Applied Communication Research of Stanford, California. The data and formal evaluation by ACR will be reported in Section V. The observations discussed in this section are, rather, the compilation of the views of the project managers and designers, based upon their experiences over the broadcast year, discussions with viewer participants, and comments made throughout the experiment by those individuals associated with its production.

Informal telephone interviews were conducted with representatives of the hospitals immediately after each broadcast to determine audio and video clarity of the signal received, the general response to the programs, and any problems the hospital might have had. These telephone interviews, along with the comments volunteered by hospital participants at various times during the broadcast year have provided additional input for the following observations.

GENERAL OBSERVATIONS

Hospital Participants

The most frequent and consistent attenders of the VA programs broadcast on ATS-6 were nurses, including registered nurses, licensed practical nurses and nursing assistants. There are; of course, far more nurses than physicians or any other type of health professionals practicing in the VA hospitals, and nurses have also traditionally shown more interest in continuing education programs than have physicians.[4]

In designing the program for ATS-6, the experimenters hoped to reach a large physician audience, too. For this reason a good many of the broadcasts had physicians as the target audience, and a majority of the teleconsultations were intended for physicians only. The difficulty, however, lies in defining a specific "physician" audience. As is true of the practice of medicine throughout the United States, there are few general practitioners remaining in the VA. Most physicians now are specialists, and to interest them a program must deal with some aspect of their speciality. This can be done, and very successfully, as is evidenced by the reaction to one video seminar: "Fiberoptic Endoscopy," concerning a highly technical diagnostic procedure. The difficulty in presenting this kind of highly specialized program on television, however, is that it is of interest to a limited audience. The result is that

premium satellite time, production expense, and support costs will be spent to reach perhaps two or three physicians in each receiving hospital, all of whom will praise and ask for more of "this kind of program." In the meantime the nurses, who attend programs for almost any target audience, as well as the dentists, therapists, psychiatrists and other specialists, protest that the program had nothing for them, and ask when will there be a program presented in their specialty.

In experimenting with the satellite, attempts were made to satisfy most specialty demands. The goal of the VA/ATS-6 experiment was to test many kinds of communications with various types of audiences. Therefore many narrow-target programs were included in the broadcast schedule, along with programs intended for more general audiences. The range extended from patients and their families, to the physician specialist interested in new diagnostic techniques. The producers knew from past experience the kinds of programs that would appeal to these various audiences, and past-proven approaches were used in many instances. There were exceptions, however, such as the effort made to attract an audience on a "team approach" basis, for which the two-hour broadcast period would be divided into two programs, both dealing with the same disease entity. The first, directed to physicians, would discuss technical aspects of diagnosis and treatment. The second, intended for the entire "team" would discuss treatment and care and attempt to include the roles of all team members. Some physicians protested that both programs were too general.

Physician comments regarding the programs were generally positive, however, and considering the number of them practicing in the ten hospitals, the physician audience for all broadcasts was considerable. Their specific reactions, and some changes that occurred because they attended the broadcasts, will be discussed in **Section V: Data and Evaluation.**

The audience make-up included more than the hospital participating in the ATS-6 programs. There were many individuals who listed their position as "other," among them were psychiatrists, dentists, therapists and allied health professionals. In addition publicity for the programs attracted professionals from the community surrounding the participating VA hospitals. These "non-VA" participants included physicians and nurses, therapists, and in some instances clergymen and social workers, all of whom had an impact on the experiment as it progressed through the year.

HOSPITAL MILIEU

An important variable in the acceptance of the ATS-6 broadcasts in each of the ten participating hospitals was the milieu in which it was received. Milieu in this case includes factors such as the attitude of the hospital director, the enthusiasm and efforts of the five coordinators, and the physical setting in which programs were received.

The Attitude of the Coordinator

Each hospital within the VA system is a separate entity, devising much of its own policy and determining what will be supported in its operation. The key to determining such policy is the hospital director. For this reason, the attitude of the director, particularly his enthusiasm, was considered an important aspect in selection of the ten VA hospitals to participate in the ATS-6 experiments. Unless the director accepted and approved of the project, physicians and other professionals practicing in his hospital were unlikely to hear about the broadcasts, much less attend them. Time is a valuable commodity for a health professional in a VA hospital.

At the outset all of the ten participating hospitals, therefore, had directors who were generally quite enthusiastic about the experiments. A majority continued to approve and support the project. The exceptions became manifest during the course of the project. They occurred for two reasons:

1. The original director of the hospital was transferred during the project and the new administrator was unaware or otherwise unsupportive of it; and

2. The enthusiasm of the director had been generated due to a misunderstanding of the role his hospital would play during the course of the experiment. When the experiment was announced and described, he thought that his hospital would be a teaching hospital for the other participants. When he learned this was not the case, that his hospital would be on the receiving end for instruction, he was no longer supportive.

The Enthusiasm and Efforts of the Coordinators

Next to the attitude of the director, the attitudes of the five coordinators for the experiment were important variables in determining how many people attended programs, filled in questionnaires, and responded to the project generally.

These five included the *medical coordinator,* responsible for deriving subjects of interest to doctors and informing them when upcoming programs would be of interest to them; the *nursing coordinator* who performed the same function for nurses; the *evaluation coordinator* who collected data as background prior to the experiment and provided feedback in the form of attendance lists and questionnaires and telephone information during the course of the project; the *engineering coordinator* who maintained the ground receiving equipment and reported any problems or failures; and the *communications coordinator* who was in charge of publicity for the experiment.

One or more of these individuals took responsibility for printed material, the posters announcing upcoming programs and study guides, if there were any. In some instances the physician coordinator did not function well in this role, and so the nurse coordinator took over and saw to it that physicians in her hospital were informed of upcoming programs and received study guides. Occasionally the nurse coordinator took on the role of the communications coordinator, seeing to it that outside groups were invited to the broadcasts of interest to them.

In one instance, the evaluation coordinator was invaluable in maintaining interest in the programs, in seeing to it that information from the hospital was provided to the evaluators and the director of experimental design. He also redesigned one questionnaire to make it simpler for respondents to fill in and return to the evaluation group.

In some instances the efforts of the coordinators were enough to maintain some enthusiasm for the ATS-6 experiments despite a lack of support on the part of the hospital director. Even though they were able to do this, they reported frustration with the effort and felt that administrative support could have done a great deal to increase audience size and participation, and therefore increase the data on which to determine the relative success or failure of satellite communications in their hospital.

The Physical Setting

Another important variable in determining acceptability of the broadcasts by hospital participants was the environment in which they were received. In one instance the programs were received on television sets located in a large auditorium where

participants had difficulty seeing the small picture and where the sound was distorted due to echoing and otherwise poor acoustics. The auditorium was not air conditioned, and so it was also very uncomfortable on warm days.

In another hospital participants were divided. They could view the programs on television receivers in three small rooms located throughout the hospital, but only one room was equipped with the two-way telephone for interaction.

Other hospitals had smaller audiences, or more television receivers in the same room, so that people could see the picture at closer range; and there were few complaints about not being able to see or hear, except when questions were asked, a problem that will be discussed in the following subsection. With the exception mentioned previously, most of the hospitals apparently provided physical settings where audiences could see and hear well and felt comfortable during the broadcasts.

TECHNICAL PROBLEMS

During the course of the experiment, the ten hospitals usually reported receiving a clear audio and video signal from the satellite. They frequently compared it with the signal they received on home sets, saying that the picture from the satellite was superior. Occasionally one of the hospitals on the fringe of the satellite footprint would report poorer reception than usual. Once in a while, a hospital reported a poor signal caused by a malfunction within their hospital system. Normally, though, the satellite was reliable in transmitting a clear signal from Denver.

The primary difficulty reported during the entire experiment was that audiences could not hear or understand certain questions asked by participating hospitals. One reason was the problems caused by misuse of the push-to-talk telephones, described in Section III. Another was that many of the physicians, the group that asked most of the questions, were foreign born and their accents made them difficult to understand. A setting that was poor acoustically in the first place exaserbated the problem. The suggested solution to the problem was to have the physician moderator repeat the question before answering it, which he did. This too was occasionally criticized because too much time was taken for repeating the questions asked by people in the hospitals.

RESPONDING TO FEED-BACK FROM PARTICIPANTS

Throughout the experiment, attempts were made to respond to suggestions and complaints from participants in the ten hospitals. For example, when several coordinators complained that the posters announcing the schedule of upcoming programs were too small and difficult to work with, and that there were not enough of them for their hospital, a new poster was designed. This one was three times the size of the first, was reprinted in quantity requested by each hospital every three months, in a new color. Program schedules were printed on gummed labels. To change program announcements, the coordinator had only to peel the back of these labels and press them in the place indicated on the poster. This flexibility and ease in announcing programs was felt to be important. One intent of the experiment was to provide programs as they were needed by the participants, or when a subject became especially timely. A tight program schedule, strictly adhered to throughout the year was a restriction to be avoided.

When the broadcast schedule was changed to include such timely or important programs, the changes were announced at least three weeks in advance of their broadcast day. The changed schedule was announced during the regular program broadcast by satellite, and new gummed labels were sent to the hospital coordinators. Nevertheless, many hospital participants, especially non-VA members of the audience, complained that they did not receive the schedule change information and therefore wasted their time in coming, sometimes many miles, to see a program of no interest to them.

Other recurrent criticisms were that there was not enough time for questions and answers and other live dialogue from the hospitals, and that study guides and other printed material was late in arriving, available in too small a quantity, or nonexistent for the program. These two problems of live participation and printed information will be discussed next.

TIME ALLOTTED FOR QUESTIONS AND ANSWERS FROM HOSPITALS

A scenario often repeated for video seminars, grand rounds and out-patient clinics would be as follows: the formal presentation would be made first. This would include a film, or videotape, or for grand rounds, a graphic lecture-presentation by the consultant originating from the Denver studio. The time was then opened for telephone feedback in the form of questions or discussion from the ten hospitals. The hospitals were invited to participate according to network: red or green. The program moderator would then ask questions he had prepared on the day's subject, while waiting for hospitals to call in. If a question should come in from a hospital, he would cut the discussion of his question short to take the telephone call. Sometimes it was necessary to "fill" with dialogue among the moderator, consultant and panelists in the Denver studio because there were few incoming calls from the hospitals. Then, ironically, toward the end of the program, several calls would come in, and each caller might have more than one question which could not be dealt with in the time remaining. When the broadcast time ended, hospital participants were asked to write in their unanswered questions and the letter would be forwarded to the faculty members for the program. Even so, frustrations were expressed indicating a desire for more interactive opportunity.

The program producers were concerned primarily with using satellite time wisely. Dead air space, where nothing happened while panelists waited for calls from the hospitals, would not only be a waste of satellite time, but would also probably result in a lost audience. For this reason, they planned to fill the whole two hours, in case there was no hospital participation. Then as the broadcast year progressed, and many people did call in, the preproduced materials were shortened. Then, on two occasions when there were no callers for almost the whole hour, there were some awkward moments on the Denver set while the moderator attempted to fill the time, and once filled it by lecturing to the hospital audiences about their responsibility in the two-way project.

The exact equation for how much time in any one program should be planned and produced, and how much of it left open for live discussion, was never arrived at during the course of the broadcast year. It is one of the most elusive elements in the attempt to meet requirements of participants for an interesting, involving, informative program.

PRINTED SUPPLEMENTARY MATERIAL

Another dilemma that remained unresolved throughout the broadcast period was how to provide printed material, in the form of study guides, that would include the most usable information and at a time participants were most likely to use it. In the planning stages for the experiment, hospital coor-

dinators said they did not want to receive study guides until just prior to the broadcast they would supplement. They did not want to pass them out before the programs because people were likely to misplace or forget them, and there would not be enough to pass new ones out when the programs were aired. Previous experience had also taught them that people were unlikely to use the materials until they saw the program.

For this reason study guides were most often sent to the hospitals just a few days before they were to be used. On two occasions they were sent much earlier to comply with the request from people who said they wanted the material in time to prepare for the programs. This resulted in several complaints that the guides had come too early and were lost. On a few occasions, preparation and printing time resulted in late shipment of these materials, so they arrived after the program had been broadcast.

Another request made frequently by hospital participants was that printed supplementary information be made available for all events, not just video seminars. The decision had been made in the experimental design stages, however, to eliminate printed material for out-patient clinics and grand rounds, since the seminars would provide adequate opportunity to test the value of the printed guides.

In addition to these general responses to the VA/ATS-6 experiment as a whole, the project designers and producers also made some specific observations during each of the individual events. These will be described in the following subsections.

1. VIDEO SEMINARS

As the broadcast year progressed and attendance lists and reactions came back from the hospital participants, it was evident that video seminars were more popular, at least in numbers of participants, and positive reaction than other events. One reason for this may have been that, because they were supplemented with a study guide, the video seminars were approved by several professional groups (including the American Medical Association) for credit in continuing education. The programs for physicians, in fact, received Category I accreditation.

A second reason for the popularity of the video seminars may have been that they were well produced; comparative with commercial television. During the telephone interviews following programs, the frequent response from evaluators in the hospitals was that the audience praised the broadcast for its high technical and production quality. For reasons already stated, there was very little air time that was not planned for during the video seminars. The combination of software, interaction between moderator and panelists, and live question-and-answer segments with the hospitals, provided the constantly-changing picture and sound needed to prevent habituation and therefore maintained high audience attention. The evidence of this is that according to observers interviewed after the broadcasts, audiences tended to stay seated and wandered in and out of the room less throughout the video seminars than during grand rounds, teleconsultations and out-patient clinics.

A future effort might be improved by structuring the seminars somewhat less, and providing more opportunity for interaction.

2. GRAND ROUNDS

Grand rounds events had two hurdles to cross to achieve the goals intended by the experimental designer and program producer. The goal was to provide hospital participants with a similar experience to the participation in grand rounds in a medical teaching center. The obstacles were that the setting was not a hospital, it was a television studio; and that grand rounds would inevitably be compared with video seminars for audience appeal and interest, yet the programs would have no preproduced materials or study guides.

The primary complaint regarding grand rounds was that the programs were not supplemented with study guides. The second most apparent problem was in the presentation. Rather than taking advantage of the traditional format of grand rounds as they take place in the hospital, by presenting one or more patients and using a provocative "detective" method to arrive at diagnosis and management of disease entities, faculty coordinators for grand rounds events often chose a didactic approach to presenting information. On the occasions when a patient was presented, by videotape, the presentation was well received.

If grand rounds were to be utilized in future satellite communications, they would probably attract and hold a greater audience if they could center around an actual patient, and could be presented live, from a hospital setting. Television cameras, lighting and other equipment have become less obtrusive to the point that they need not be obstructive to grand rounds presentations as they routinely take place in these medical center settings. With this approach, grand rounds would differ significantly from the video seminars, so that they would present a unique experience for physicians and other practitioners in the hospitals.

3. OUT-PATIENT CLINICS

The three out-patient clinics were well-attended events, but not by patients. They received much praise and much criticism. The goal in planning these events was to involve patients and families in dialogues with the specialists in the Denver studio, but two obstacles made this difficult. First, the hospital audiences were not comprised solely of patients and their families. They also included nurses, physicians, and other professionals, and the presence of these people plus the satellite and television technology prevented all but a minimal number of questions. Questions asked were mostly from nurses, or written out by patients and asked by nurses. Second, the faculty coordinators for the programs in some cases tended to address their colleagues on their own level rather than provide information for patients in context and language they could understand. Patients sometimes protested that the programs were over their heads. To ameliorate this partly, a patient was included on the panel in the third OPC, on cardiac rehabilitation, and this program was the most popular of the three.

The latter program's popularity may also have been attributable to the subject it treated: cardiac disease as opposed to alcoholism and drug abuse, the subjects of the other two OPC's. Patients having cardiac ailments seemed less inhibited in discussing their problems than were patients with the other two diseases. Feedback immediately following all three of the programs indicated, however, that the patients who did attend them were most interested in the information presented. Nurse coordinators reported that resulting videotapes of the programs were being used for patient education programs, as well as in-service training for professional groups.

Ideally, future programs for patients and families will be planned for patients as a target audience, and faculty coordinators will be selected for their ability to address this

audience on their level of medical sophistication (but not speak down to them). Printed material should be provided for these programs, too. Many kinds of informative documents are available from volunteer health agencies. The problem here is to locate them, assure their appropriateness, and distribute them in time for broadcast.

The question of whether or not two-way communications are significantly important to the audience of an out-patient clinic is a difficult one. These audiences tended not to use the opportunity to ask questions, but perhaps the situation preventing their participation could be altered. For example, the audience could be restricted to patients and families only.

4. TELECONSULTATIONS

The goal of these events was to provide an opportunity for physicians (and in some instances nurses) to consult with specialists about problems they were having in diagnosing, or treating actual patients. The intent was to bring hospital physician (or nurse) together with the consultant, connecting them by satellite and television, rather than by travel. Ideally, the technology could save much time and expense for such consultations on a routine, daily basis.

The primary problem in achieving this goal was that the teleconsultations were not private one-to-one events. Like the other satellite broadcasts, they had an audience, both participatory in the originating and "observing" nine hospitals, where all satellite broadcasts were monitored, and in other places. There was, therefore, a feeling of a need for showmanship on the part of each hospital presenting a teleconsultation. Physicians were reluctant to show lack of current knowledge in the extreme lack of privacy. Their goal became to show the expertise of their hospital. In most instances, the presenters would state how they treated a patient, who by then had died or been treated and discharged from the hospital. The intent was not to gain information as to how they might have diagnosed or treated the patient, but rather to challenge the specialists in Denver to do it better.

Fortunately there were enough exceptions to this pattern, so that it can be said the media worked to provide information so that patients could be better cared for. The teleconsultations concept potentially has great viability, and the satellite could be extremely valuable in overcoming problems of time and distance.

Two-way television is not a necessary ingredient for accomplishing this. The VA/ATS-6 Experiment utilized slow scan TV for sending pictorial information to the consultant. Although apprehension was expressed prior to the experiment about this technology, especially when it was to be used for transmitting X-rays and histopathology slides, there were few, if any instances during the actual teleconsultations when the visual transmitted was less than adequate for diagnostic purposes. The main complaint was that the slow scan process took a long time to display a visual, despite the fact that most of the black and white visuals had been stored previously so that they could be displayed instantly, when needed. The only time the actual scanning process had to be used to display a visual was when it was in color, and only then if it was the second to be used. One color visual could be stored prior to the broadcast.

As for visual clarity of the X-rays and other visuals, the consultants for several programs stated at the end of the program that the slow scan mediated visuals were adequate. During the teleconsultation on radiography, the television camera on location was used to focus on a close up of one portion of a chest film. The resulting visual, sent via slow scan, was adequate for a panelist, a specialist in "middle lobe syndrome" to detect a peculiar shadow alongside the heart in the right hemithorax, a shadow not present in a chest X-ray taken two years previously. He diagnosed the patient as having "middle lobe syndrome." In a letter written December 12, 1974, Roger Hamstra, M.D., moderator of the broadcasts, documents this and two other instances in which teleconsultation events, incorporating slow scan, altered diagnosis or treatment of a patient in the consulting hospital.

The teleconsultation events on ATS-6, therefore, indicate that satellites and adjunct technology can successfully alter and improve patient care in isolated hospitals. If satellites are to be used to transmit future consultations, however, the settings and circumstances should probably be different from what they were for the VA experiments on ATS-6.

First, the communication between consulting physician and specialist should be discreet. Routineness of this method might eliminate some non participating observers, but other methods, too, should be employed to insure privacy.

Second, to be truly effective as a mediator of consultations, satellite linkage must be available 24 hours a day, seven days a week, as must the consultant at the other end. Consultation services have been developed in major metropolitan areas, so that physicians can call a medical center and be connected with a specialist on duty at the time. Perhaps a satellite inter-link could provide contact with a nationwide network of specialists, each of whom "covers" a certain time period during which he is available for consultation as physicians in group practice who "cover" for their colleagues.

Third, full duplex video is not really necessary for the teleconsultations. One way video is useful, but it should be from the hospital to the consultant, because most of the visual information will originate in the consulting hospital. The specialist might have slow scan available for sending information, if and when it is needed.

If a video-originating capability is not possible, slow scan is adequate in most cases for teleconsultations. Slow scan plus an audio channel is probably a viable substitute for full duplex television if the cost of originating video becomes prohibitive on a permanent domestic satellite.

Fourth, in further experimentation with teleconsultations, particularly when video capability is employed, all "showmanship" should be discouraged. Teleconsultations must not be regarded as television productions reflecting on the creative talents of the originating hospitals.

5. COMPUTER MEDIATED EVENTS

For both computer-mediated events of the VA/ATS-6 experiment, the software provided seemed to be well accepted in the hospitals. The difficulties in providing them by satellite were technical and primarily due to the decreasing transmitting power of ATS-3, the satellite used to return the signal from hospitals to computers. If computerized events are used in future satellite communications, the two-way linkage should be available continuously. Otherwise the advantages of computer-mediation are lost.

The computer-assisted event was most successful in terms of how it was received at the VA in Fayetteville, and this during the two weeks when the program was available 24 hours a day. The fact that the program was available by satellite for only two hours a day once a week was much to the detriment of the program. The satellite in this instance was not as useful as traditional land lines for providing a communications linkage between user and computer. This was due primarily to restricted time on ATS-6, and the fact that ATS-3 was failing,

rather than inherent problems with the satellite acting as a transmitter. Potentially the satellite may be a better transmitting device than landlines because landlines used to access computers frequently fail or are overburdened with users.

6. VIDAC

During the ten weeks VIDAC programs (still frame pictures transmitted at high speed) were available at the Dublin VA, 42 individuals viewed selected programs and completed evaluation forms. This was 20 percent of the possible target population and included, primarily, nurses, dietitians and laboratory personnel. Usage was restricted to the day shifts because television facilities were unavailable at night for security reasons.

In their report of the VIDAC experiment on ATS-6, which included data from the evaluation forms collected by the Dublin evaluation coordinator and analyzed by the Florida State University evaluators, the Westinghouse group said that the small numbers of program users could be attributed to the lack of support on the part of the hospital administrators. The report states that those who did use the VIDAC programs were "impressed, enthusiastic and generally felt that a program of this type would greatly benefit them as well as the hospital, and in the opinion of some, the entire VA network." Present features "considered ideal" by users were the random access concept and a multiple viewing possibility, but "motion is almost essential in the limited instances when certain motor skills are being taught."

Among other things, the report offers the following conclusions regarding the VIDAC system:

The time required to broadcast many *hours* of material is measured in *minutes*, which should permit reduction of the operating costs of television facilities; and VIDAC central libraries could serve an area approximately one-third the size of the earth by utilizing a single dedicated satellite channel.

The evaluation coordinator at the VA hospital in Dublin was asked to comment on the VIDAC system. He said that he felt the resulting programs were not much different than the slide-tape programs they had in their library. Operating the system required a full-time employee, available to "punch up" programs when they were requested on one of the four channels on the hospital's television viewing system. If a program was allowed to run continuously (one of the modalities evaluated in the experiment) that channel could not be used for any of the other videotapes or films the hospital has available on its informational access system.

The evaluation coordinator said that the programs received via satellite were frequently unusable because they were unclear. The Westinghouse group attributed this on one occasion to the satellite having been "mispointed" thus dropping 10db. At another time, the difficulty in transmitting the VIDAC programs was said to be caused by a technical malfunction at the Denver studio. The Dublin evaluation coordinator reported that the primary technical difficulty was in the receiving equipment at the hospital. It tended to overheat and distort the image and sound received.

The Dublin coordinator said that more people might have been informed of the VIDAC programs and participated in the experiment if it had been better managed. As it was, he was given the equipment and program catalogs and told to publicize the experiment throughout the hospital, operate the system, evaluate it and maintain the equipment. This was more than a full-time job, he said, and he did not have time to do it.

SUMMARY

The designers and producers of the events comprising the VA experiment on ATS-6 formed opinions about what was taking place during the program broadcasts—how they were received, how they might have been better—all during the broadcast year. The bases for these opinions were the telephone calls that came in during the programs, the responses given during the telephone surveys immediately after the broadcasts, and unsolicited comments that came in to the FACT office during the experiment. The formative evaluation from the Stanford group, of course, added greatly to this basis of opinion. After the experiment was over, the Stanford group went on to conduct retrospective analyses. The data from these, plus their observations during the year, make up the following section: **Data and Evaluation.**

Satellite Will Connect 10 VA Hospitals
By MAURICE KAPLAN
Post-Herald Staff Writer
FIRST OF 50 PROGRAMS
Satellite Television Used in Experiment
By DAN PARTNER
Denver Post Staff Writer
VA Hospital in W-B Part of New System
HEW Involved in Satellite Launch from Kennedy Space Center
'Perfect' Satellite Picture Sent Hospita
VA Hospital to Use Satellite Wednesday
SATELLITE LIFT-OFF
space
Satellite
Teacher
SATELLITE REFLECTORS

RED NETWORK

Section V:
Data and Evaluation

(by Applied Communications Research, Palo Alto, California)

INTRODUCTION

The experiment impacted the ten experimental hospitals on several levels. Nearly all individual events provided information which was used by some segment of the hospital staffs. Many, such as the presentation on G.I. infections, had a significant impact on hospital procedures in nearly every hospital. The six experimental events had varying success. Video seminars seemed to have the greatest impact and were the most popular. The other end of the scale was represented by the CAI events which were plagued by technical problems. The most profound effect, however, was that of the experiment as a whole on the hospital staffs.

1. Methodology

The VA/ATS-6 events can be divided into two groups: those designed for delivery to groups (video seminars, grand rounds, outpatient clinic and teleconsultation) and those designed for delivery to individuals (CAI and computer-mediated patient management). The teleconsultation events should, perhaps, be classified as individual delivery events. However, the form in which they were used was more that of a hospital-originated grand rounds than a one-to-one consultation.

The evaluation of these events is based on a variety of data collection techniques. The group events were evaluated using a combination of data gathered by direct observation, interview, and audience reactions (collected both via an evaluation form completed immediately after each broadcast and via retrospective questionnaires administered two—three months after broadcast). Because of changes in questionnaires and time problems, questionnaire data collection was not uniform across the experiment. The following table shows what types of questionnaires (and how many) were completed for each of the four group-oriented events. The program evaluation questionnaires were those completed by the audience immediately after each broadcast. The partial retrospective questionnaire referred to in the table was the initial prototype questionnaire which covered the first 14 events broadcast. This questionnaire was substantially revised into a much more powerful instrument (the full retrospective questionnaire) which is the foundation for much of the evaluation.

	Number of Programs	Program Evaluation	Full Retrospective	Partial Retrospective
Video Sem.	38	37	19	9
Grand Rounds	16	16	11	4
Teleconsultation	10	10	10	
Patient Seminar	3	3	2	1

The events directed towards individuals (CAI and computer-mediated patient management) were evaluated primarily by observation and interview. Data collection for these events was limited as a result of a number of problems which are discussed in subsection 6.

In summary, evaluation data were collected via the following methods:

Pretest—a four-page questionnaire distributed just prior to the first broadcast. The pretest was used primarily to collect data on existing information-seeking patterns in the experimental hospitals and to measure initial expectations towards the VA/ATS-6 project.

Evaluation forms—one-page questionnaires distributed for every program broadcast which were used to collect immediate audience impressions of the programs. In addition, the return volume of these forms was used to provide some measure of attendance.

Retrospective questionnaires—four-page questionnaires distributed periodically to measure the impact of previously broadcast programs. Four retrospective questionnaires were distributed, each covering 10—18 programs.

Post-test—a four-page questionnaire distributed at the end of the project to assess the impact of the entire VA/ATS-6 experience.

Site visits—a field representative of ACR traveled throughout Appalachia during the ten months of the project visiting the experimental hospitals and interviewing staff members to obtain their reactions both to the project as a whole and to individual programs. In addition, where possible, he observed broadcasts in the hospitals. After the experiment ended, Dr. Roger Hamstra, the physician moderator, also site visited four of the experimental hospitals to analyze the impact of the experiment on medical care provided by the hospitals.

Consultant evaluation forms—forms distributed to consultants who participated in the ten teleconsultation events to collect their impressions of the teleconsultation experience.

Participant evaluation forms—forms distributed to experimental hospital staff members who made presentations in the teleconsultation events to obtain their reactions to the teleconsultations.

The following table shows how many data were collected by each of these measures and how many of the 69 events (including introduction and debriefing) were covered by each technique.

Instrument	N. Programs Covered	Instruments
Pretest	n.a.	547
Evaluation Forms	67	12,533
Retrospective	56	1,076
Post-test	n.a.	302
Site Visits	n.a.	44
Consultant Eval.	10	26
Participant Eval.	10	100

2. VIDEO SEMINAR

The video seminars were the most frequent type of program (N=38). They were also the most popular type of program and were very well attended. Average attendance, based on program evaluation sheets for 37 programs, was 199.07, with a standard deviation of 61.13. This figure is, however, a considerable underestimate. By comparing returned program evaluation forms with available attendance logs, we predict that the actual attendance averaged about 400 per program or 40 viewers per hospital. The most heavily attended program was the initial video seminar on problem oriented medical records, for which 413 program evaluation forms were completed.

In addition to being the most well attended of the experimental programs, the video seminars were also the most highly rated. The mean rating for the 28 events covered by the retrospective questionnaires was 1.87 on a scale of 1 (very good) to 5 (very poor). This mean was based on 1,942 individual program responses. In addition, the most highly rated of the 42 events covered by the full retrospective questionnaire was a video seminar (Fiberoptic Endoscopy) with a mean rating of 1.36 (based on 61 responses).

In general, responses to the video seminars were very positive. There were, of course, minor complaints about material or presentation techniques with most of the programs. One relatively frequent complaint, for example, was that the events were "over produced" and lacked spontaneity.

A second frequent complaint was that the time provided for discussion was far too short. After a number of these comments had been received, an alternate delivery technique was employed for one program (Pulmonary Embolism). The preproduced portion of this program was sent to the hospitals in advance so that it could be viewed prior to air-time and the entire hour could then be spent on discussion. Response to this variation was mixed. The previewing time created scheduling problems—particularly for non-VA physicians who wished to attend. Comments from four hospital evaluation coordinators are summarized below:

Approximately 80 people viewed the film prior to broadcast, 15 viewed the broadcast. The audience felt the old way was best.

Fifty-four people viewed the tape prior to broadcast and 27 took part in the live question-and-answer session. People attending felt this mode of presentation was preferable, even though it was more time consuming. Physicians did not get much out of the question-and-answer period and tended to prefer the prepared program.

The tape was shown twice before the broadcast and a total of 39 attended. Forty-one attended the broadcast, but only one took part in the question and answer session (approximately 15 of those present at the broadcast had not viewed the tape).

Reactions were mixed—the extra discussion time was appreciated, but the additional session created scheduling problems.

Approximately 30 people viewed the program prior to broadcast, but only a small percentage of these were present at the broadcast. There was little or no participation in the question-and-answer session.

The impact of the video seminars appears to have been quite high. Of those who reported seeing video seminars (3078 viewer experiences, 1 viewer experience=1 person viewing 1 program), 47 percent reported that they discussed the information presented with their colleagues and 43 percent reported using the information in their work. In addition, 29 percent reported that they sought and obtained additional information on topics presented and 18 percent reported that they made changes in their work because of the programs. (These findings are based on responses to the 19 video seminars covered by the full retrospective questionnaires.)

3. GRAND ROUNDS

Grand rounds were not as popular as the video seminars. There were fewer of them (17 events as compared to 37 video seminars) and the mean attendance (again, based on the evaluation forms) was lower—182.0 with a standard deviation of 58.46. Again, as with the video seminars, we should point out that this figure is low since it is based only on the returned evaluation forms. The actual attendance per program was probably at least double this figure.

In addition to low attendance, the grand rounds were also rated lower by those responding to the retrospective questionnaires. The mean program rating (based on 774 viewer experiences) was 2.2 on the 5 point scale (1= very good). The lowest of the 42 events rated was a grand rounds (Behavior Modification I) with a rating of 3.64 (92 viewers responding).

Responses to the grand rounds were more mixed, perhaps because the viewers were able to focus more on individuals.

One complaint constantly appeared on the evaluations of the grand rounds events: lack of any printed material to go with the event. Although these events were not intended to be accompanied by printed material, complaints from respondents about the lack of such material were loud and clear.

The impact of the grand rounds events (15 covered by the retrospective questionnaires) appears to have been somewhat lower. Of those who reported viewing the grand rounds events (1237 viewer experiences), 38 percent reported discussing the events with their colleagues, 40 percent reported using the material presented in their work, 22 percent reported seeking additional information on topics presented, and 12 percent reported changing techniques due to information presented.

4. TELECONSULTATION

The teleconsultation events were, as noted earlier, somewhat different from what was originally intended. The purpose of the event was to test the viability of satellite-mediated teleconsultation. Because of problems with the satellite (discussed in an earlier section) and time limitations (the events had to be scheduled in advance for a particular time and, in some cases, had to be augmented by advanced videotaping), the teleconsultation events ended up being more hospital-originated grand rounds than teleconsultations. Cases were selected by the presenting physicians and nurses in advance, sometimes perhaps more for demonstrating the competence of the presenter than for obtaining advice. Despite these problems, however, the responses to these events suggest two major points: (1) that satellite mediated teleconsultation is viable, and (2) a hospital-originated grand rounds has more appeal than does a grand rounds program coming from a remote, unknown location.

Because of the special nature of the teleconsultation event, additional data collection instruments were employed. In addition to the regular program evaluation forms filled out by viewers, special forms were prepared for physicians and consultants participating in the program in order to obtain their reactions to the teleconsultation.

In general, both the presenting physicians and the consultants were highly enthusiastic about the potential for teleconsultation, although some were less than enthusiastic about the specific consultation in which they participated.

The following comments are representative of those made about the teleconsultation event. They have been selected from the consultant and participant evaluation forms and from the program evaluation forms completed by the teleconsultation "audience" (non-participating hospitals).

Almost all hospitals complained that foreign-born personnel were difficult to understand. Personnel at several hospitals also complained that the program was designed principally for doctors and that not enough information for nurses was included. Several favorable comments indicated that the program was better than the usual "canned lectures"; that the program brought together valuable medical knowledge, interesting cases, and interesting opinions from different physicians and that the program was a good way to educate doctors who need prodding to bring themselves up-to-date.
Viewer Comment—Silicosis—November 20, 1974

I would suggest either the original X-ray film or copies be given to the participants rather than using slow scan. Copies should also be made available to participating groups. The X-rays were poorly visible. Much of this was due to the poor placement of the camera at the origin—there was inadequate attention to brightness, contrast and sensitivity of the transmitting camera.
Consultant Comments—Silicosis

Several individuals felt that the first case presented was a "waste of time." Otherwise, the program was considered good and the consultants were considered excellent. Many people felt that there was a great deal of benefit to be gained from the variety of solutions and criticisms presented for handling cases. One individual stated that the program had limited potential for non-participants.

Some individuals felt that, for the material to be of value to pathologists, prior opportunity to examine the slides is essential. One person stated that the photomicrographs were of poor quality and that the consultants should study the cases beforehand for better discussion. Several physicians also commented that they would like to see the histopathology of the liver and kidneys.
Viewer Comments—Histopathology—November 27, 1974

The physicians presenting the cases were not sufficiently versed in details to answer promptly questions asked from the panel.

The hospital videotapes were not in color which is essential to proper evaluation. Slow scan was too slow. This program has an exciting potential but it needs much more understanding between medical and television experts.
Consultant Comments—Histopathology

This type of consultation has high potential if the case material can be known in advance so appropriate consultants can be brought in. Chest X-rays were too poor to be of value.
Consultant Comments—Cardiovascular Surgery

There was considerable loss of detail when blow-ups were made during the slow scan process. There was some difficulty in centering on points of interest in the slow scan. There certainly seems to be some potential to this technique, but I wonder about the costs. Once we became familiar with the format it all ran fairly well. The reproductions were only fair and the slow scan does take long enough to interfere with the consultation somewhat.
Consultant Comments—Radiology

The slow scan would have been better in color. I had hoped for more participation from the audience. This seems to have extremely high potential—especially for non-physician health care workers who do not enjoy the avenues of communication open to most physicians. The feedback from the listeners at the various VA hospitals seemed lukewarm. I teach better with a blackboard and a few 2x2 slides to illustrate technical points. Neither was available for our session.
Consultant Comments—Technical Aspects of Dialysis

Many of the cases had little or nothing to do with the management of arrhythmias. One case seemed to have been presented solely to generate an opinion from us that could have been predicted quite easily, i.e., the case was used to support a position and not really to teach. Many of the cases were not therapeutic problems but seemed to be presented to point out the clinical acumen of the presentor. Presentations should be much shorter. The slow scans were amazingly clear. Some sort of device is needed (e.g., electronic calliper) to demonstrate arrhythmias on the screen. The interaction needs more colleague-to-colleague flavor rather than primary physician-to-consultant flavor.
Consultant Comments—Cardiac Arrhythmias

Personnel at Salem complained that the panelists did not seem to be too well versed in geriatric care. Salisbury also complained that the consultants answers were too vague. One physician felt that the cases were too "typical" and that a "surprise" case should have been used.
Viewer Comments—Problems of the Geriatric Patient

Presentations took up so much of the time, there were so many cases and so many on the panel, it seemed that each question was quickly responded to without much opportunity for thought, interchange or feedback. I felt many questions were left unresolved and almost glossed over. I believe there is considerable potential for learning both by those who present the problems and by non-participant learners, but I am not sure the same kind of "program" meets both needs.
Consultant Comments—Nursing Care in Long-Term Illness

Too much delay for good interchange with hospitals. I would like a little more flexibility and informality—the opportunity to move around and use classroom-type tools. This mode of presentation seems stresstul and stilted to me.
Consultant Comments—Pancreatitis

I feel we did not give adequate answers to all of the questions presented. It was unfortunate that as a panel we did not agree on "potential" patients for speech therapy.
Consultant Comment—Speech Therapy

The following comments were offered by the ACR field representative after viewing one of the teleconsultation events from the originating hospital:

Slow scan was used in the presentation of X-rays, patient histories, shots of the hospital staff and slides. The doctor presenting the case with X-rays said he was extremely pleased with the quality of the slow scan.

A large number of the hospital's staff were involved with the teleconsultation, but often I had the impression that the effort was directed towards getting the presentation finished and not in obtaining information. This could be partly attributed to the confusion on time use and placement of individual presentations.

A nurse in the medical service said teleconsultation was a great learning experience for her. It helped bring the doctors and nurses a realization that they were parts of a medical team, instead of two different groups, she said . . . She believed the program was geared too much towards giving out information instead of receiving it. She said the hospital could have been saved a lot of time if the procedure for teleconsultation had been better explained to the staff. She rehearsed her presentation for a total of about 15 hours over a two-and-a-half week period.

The mean attendance for the ten teleconsultation events was 157.9 with a standard deviation of 28.92.

The average rank for the ten events (based on 781 viewer-experiences) was 2.08—midway between the video seminars and the grand rounds.

The impact of the teleconsultations was very interesting. The events seemed to provoke far more discussion (60 percent of the 838 persons attending events reported discussing them with colleagues) than did the video seminars and grand rounds. Approximately the same percentage of viewers reported using information gained from the events in their work (40 percent). However, viewers expressed less interest in seeking additional information (14 percent). Reported changes in behavior (15 percent) were midway between that reported for video seminars and for grand rounds.

5. Outpatient Clinics

Because there were only three out-patient clinics presented, data available for evaluation was limited. All three of the broadcasts were covered by program evaluations, two were covered by full retrospective questionnaires, and one was covered by the prototype retrospective questionnaire.

The out-patient clinics had the highest mean attendance of any experiment—226 with a standard deviation of 28.92.

The mean rating of the two events covered by the full retrospective questionnaire was 1.98 (207 viewer experiences).

Some complaints were made that the language in the events was too technical for the patients to understand. On the other hand, the final out-patient seminar, Cardiac Rehabilitation, was commended several times for having patients participating in the panel.

6. CAI Experiments

The CAI events were the most frustrating of all the events to evaluate. In fact, because of problems encountered both in the conduct of the event and the conduct of the evaluation, we are unable to provide any substantive evaluation.

For the evaluation, arrangements had been made to obtain case data from the developers of the program on each nurse who participated in the experiment. In addition, "log sheets" were developed for the participants to record their experiences and comments. Arrangements were then made with the nurse-coordinators of the event at the two participating hospitals (Altoona and Fayetteville) to collect this data and forward it to ACR. As a final check, the ACR field representative was requested to visit each of the participating hospitals and observe the event in action.

During the course of the experiment, the nurse-coordinators for both hospitals left. As a result, we were unable to obtain any

log sheets describing the nurses' reactions to the programs. In addition, we did not obtain the computer printout describing the participants' progress from the originating CAI center. Finally, due to technical problems encountered in running the experiment, the field representative had only very limited opportunity to observe the event in progress.

What information we do have is based primarily on interviews conducted with nurses who did (or planned to) participate in the experiment.

The following are excerpts from site visit reports describing interviews conducted with nurses about the CAI experiment.

FAYETTEVILLE. Reactions at Fayetteville towards the CAI program were quite positive, although several of the nurses interviewed indicated they had only limited contact with the CAI event because of schedule problems. Most nurses interviewed expressed frustration that the program was available only two hours per week (after the initial period in which the program was available 24 hours a day).

One nurse in hospital admissions said she had only been able to use the equipment once because she had been on leave. She said the CAI program was the most effective training tool she had ever used and was a great deal more valuable to her than the rest of the ATS-6 events. She found the equipment easy to use and felt it would be very useful to her to have this program available all the time. She indicated that the reason the CAI program was more valuable to her than the rest of the ATS-6 events was that most of the other events were geared more towards physicians. Therefore, although she enjoyed learning from these programs, much of the material was "over her head." The CAI, on the other hand, seemed tailored especially for her.

A ward nurse indicated she felt the CAI program served as a constant refresher of medical knowledge. She also felt it had great potential for keeping her abreast of new techniques within her own specialty and for broadening her knowledge in other areas.

An RN in the psychiatric ward stated that, while she had not been able to use the program herself, she felt from her talks with nurses who had used it that it was an extremely valuable learning experience. She also stated that the full impact of the program had not been felt.

ALTOONA. Technical problems with the Altoona programming greatly affected the impact of the CAI program. Many of the problems seem to have been caused by equipment malfunctions at Altoona, although some program malfunctions were experienced as well. (For example, the program frequently failed to record completed exercises.)

In addition to technical problems, there apparently were some initial problems in understanding how the equipment worked. This problem was aggravated by the loss of the nurse coordinator part way through the experiment.

The following comment was written in response to a question on the post-test asking what aspects of the ATS-6 experiment the respondent would like to see repeated, should another satellite become available.

> We were impressed with the potentials of the computer program that we were unable to use due to technical problems. (I) believe this has great potential for training hospital personnel if it would be available on a 24 hour basis. (It has) great potential for special areas of coronary care, respiratory, intensive care, etc.

It is impossible to make any assessment of the CAI event based on the data available. The Fayetteville on-line experience appeared to be quite positive, however technical problems made it impossible to make any assessment of the satellite-mediated links.

In addition to the lack of information available to evaluate the CAI experiment, technical advances in the computer industry suggest that alternate means for providing CAI may be more viable within a few years. The growth of the value-added carrier industry (which provides computer communication channels over leased lines) suggests that alternate delivery means for CAI may be possible at relatively low cost. Also, rapid advances in the computer industry, particularly in the area of microcomputers, may have a significant impact on CAI within the next two years.

7. Computer-Mediated Patient Management

The second computer event performed in the VA/ATS-6 events was to assess the value of a computer-managed program for diagnosis of psychiatric patients. This program was provided to the Salisbury, N.C. hospital only.

The nature of the program made it very unamenable to traditional evaluation measure. As a result, evaluation of the event consisted of site visits by the field representative.

Some initial technical problems were encountered and in the first six weeks of operation (February 19 to April 2) only three full sessions, involving two patients, were conducted.

The potential for this type of program at Salisbury is high, as traditional diagnosis involves administration of the MMPI battery which must be sent to Minnesota for diagnosis (this requires five days). The CAI program has the potential for providing more rapid diagnosis, although this had not been the case as of April 4.

Physicians reported that the two patients seemed to enjoy using the CAI equipment. One of the two patients had refused to take the MMPI, but did not object to the CAI exercise. Neither of the two patients experienced any problems with the keyboard. Hospital officials indicated they felt only about 25 percent of their patients would be able to use this equipment upon admission, but that after some initial treatment, this figure would rise to approximately 75 percent. Some patients, because of combined physical and mental problems, would probably never be able to use the CAI program. However, this group was considered virtually untestable.

This particular program seems to offer high potential, although our data is extremely limited. The data on technical problems is insufficient to make any judgment concerning its viability for satellite transmission. However, as in the case of the CAI programs, advances in the computer industry may make other forms of transmission, or in-house computers, a more viable means of access.

8. Comparing the Group-Oriented Experiments

It is instructive to examine the four group-oriented events to see how successful each was in comparison with the others. These comparisons are based on data from the retrospective questionnaires.

The first comparison uses the ratings given each program in the final retrospective questionnaires. This form was used to evaluate 19 video seminars, 11 grand rounds, 10 teleconsultations and 2 outpatient clinics.

Type of Program	# Programs Rated	Rating (where 1=very good 5=very poor)
Outpatient Clinic	2	1.71
Video Seminar	19	1.87
Teleconsultation	10	2.08
Grand Rounds	11	2.20

The second comparison comes from the post-questionnaire and is based on 302 responses. In this questionnaire, respondents were asked to indicate which of three formats (video seminar, grand rounds, teleconsultation) they found most effective.

Respondent	N	Video Seminar	Grand Rounds	Teleconsultation
M.D.s	89	61%	18%	11%
Nurses	147	46%	16%	16%
All	302	53%	16%	14%

The third comparison comes from responses to a battery of questions on the retrospective questionnaires asking:

Which of the programs did you see?

Which of these programs have you discussed with your colleagues?

Have you been able to use any of the material presented in these programs in your job? Which programs?

Have you tried to obtain additional information on subjects covered by any of these programs? Which programs?

Have you made any changes in the way you perform your job because of information presented in any of these programs? Which programs?

The following table presents an analysis of the responses to these questions tabulated by role and by program type.

All respondents (physicians, nurses, administrators, others) responded:

	Saw Program	Discussed Program	Used Info.	Sought Info.	Changed Technique
Video Seminar	3078	47%	43%	29%	18%
Grand Rounds	1237	38%	40%	22%	12%
Teleconsultation	838	60%	42%	14%	15%

M.D.s responded:

	Saw Program	Discussed Program	Used Info.	Sought Info.	Changed Technique
Video Seminar	852	35%	42%	27%	17%
Grand Rounds	491	32%	34%	23%	11%
Teleconsultation	343	51%	34%	14%	6%

Nurses responded:

	Saw Program	Discussed Program	Used Info.	Sought Info.	Changed Technique
Video Seminar	1931	51%	43%	28%	18%
Grand Rounds	582	42%	40%	21%	12%
Teleconsultation	394	64%	45%	20%	19%

9. General Observations

This subsection covers observations not directed towards any specific experiment, but rather towards the VA/ATS-6 project as a whole. Much of the data collected—such as the pre- and post-tests, site visits, etc.—have significant impact on the potential for a satellite-mediated biomedical communication system.

9.1 Hospitals

There were marked differences in the cooperation and participation of the ten experimental hospitals. These differences were caused by a number of factors including size, relative "remoteness," staff load, and the "personalities" of the hospitals.

In some hospitals, for example, administrative support for the experiment was less than enthusiastic. This manifested itself in a number of ways—physical facilities used for showing the programs; publicity, both inside the hospital and for the surrounding medical community; morale of the staff; etc. In one hospital, for example, a site visitor encountered a senior nurse who had been on station for more than ten years, yet was not aware of the VA/ATS-6 program.

The following chart shows the mean attendance by hospital across all programs.

Hospital	# Programs Reported	Mean Attendance
Altoona	54	18.22
Beckley	61	15.90
Clarksburg	57	13.07
Dublin	63	11.05
Fayetteville	65	19.63
Mt. Home	63	20.16
Oteen	64	27.25
Salem	66	20.27
Salisbury	66	21.38
Wilkes-Barre	65	30.58
(Mean Hospital Attendance=18.99 per program)		

As noted earlier in this report, these figures are based upon returned program evaluation forms and represent a significant underestimate of the actual attendance. Several hospitals, for example, used a number of small viewing rooms, rather than one large one, but did not have sufficient personnel to administer the program evaluation forms at each location. Also, in many cases, a portion of the audience left before the program was concluded and thus did not complete the forms.

9.2 Roles

In addition to differences between hospitals, there were marked differences in the responses of the various role categories used in this evaluation. In general, nurses seemed both much more positive towards the experiment and much more aggressive in seeking information. The nurses were also far more critical of events and offered a proportionately larger share of comments than did any of the other role groups. Throughout the experiment large numbers of nurses attended events designed specifically for physicians (and frequently complained because they lacked preparatory material which would enable them to better understand the programs).

The following table shows the mean attendance by role across all events and across all ten hospitals.

Role	Maximum Attendance	Minimum Attendance	Mean Attendance
M.D.	88	0	39.77
Nurse	249	26	94.82
Administrator	18	0	1.46
Other	223	0	49.60
Total	416	82	188.41

9.3 Program Ratings

As noted earlier, the most highly rated program was Fiberoptic Endoscopy and the lowest rated program was Behavior Modification I. The table below lists the events with the highest attendance.

Program	Attendance
POMR	413
Alcohol Rehabilitation	318
Upper G.I. Bleeding (Nurses)	299
POMR Update	297
Changing Role of the Nurse I	273
Death and Dying	273
Problem Drinker	264
POMR (Nurses)	263
Cardiac Rehabilitation (Video Sem.)	255

The lowest attended events were:

Program	Attendance
Pre-op and Post-op Thoracotomy Care	81
Ultrasonics in Cardiology	107
Histopathology	108
Neurological Diagnosis	109
Cardiac Catheterization	114
Changing Role of the Nurse IV	118
Behavior Modification II	121
Technical Aspects of Dialysis	132

The program most cited in the post-experimental questionnaires was Death and Dying. It obviously made a great impression on the nurses who viewed it and it was the program most frequently mentioned by them when they were asked to cite examples of how the experimental events had affected them in the performance of their jobs.

9.4 Videotapes

One unexpected result of the VA/ATS-6 events was the high use of videotapes made of the programs. Most of the hospitals videotaped the events for later use by staff members who were unable to be present for the original broadcast. Some hospitals kept a complete file of programs. Others, for economic reasons, retained only the most popular programs, erasing others to free the tapes for reuse.

Although it was impossible to obtain accurate figures detailing the use of these videotapes, the data we do have indicate that the viewing of events was at least doubled through the use of the videotapes. Often videotapes were used not only within the experimental hospitals, but were also exchanged with other area hospitals.

The following table is a partial listing of showings of program videotapes at Altoona, one of the hospitals that seemed to make great use of the videotapes. This listing is incomplete, but it does give some idea of the frequency of use of the tapes, and of the number of staff members who were present for showings.

Date	Program	Attendance
7/31/74	Changing Role of the Nurse I	22
8/7/74	Arrhythmias	22
8/14/74	Venous and Arterial Cannulas	18
8/14/74	Changing Role of the Nurse II	20
8/21/74	Alcoholism Rehabilitation	20
8/21/74	The Problem Drinker	19
8/28/74	Changing Role of the Nurse III	25
8/28/74	Family Therapy	17
9/4/74	Death and Dying I	44
9/4/74	Death and Dying II	37
9/11/74	Changing Role of the Nurse IV	12
9/18/74	Surgical Treatment of Peptic Ulcers	14
9/18/74	Diabetic Patient	11
9/25/74	Behavior Modification	6
10/2/74	Changing Role of the Nurse V	28
10/9/74	COPD	4
10/9/74	Coronary Arteriography	7
10/16/74	CPR	25
10/16/74	POMR	15
10/23/74	Genital Urinary Infection	28
10/23/74	Biofeedback	30
10/30/74	Coronary Care I	23
10/30/74	Coronary Care II	18
11/6/74	Cardiac Rehabilitation I	14
11/6/74	Cardiac Rehabilitation II	12
11/13/74	Hypertension I	21
11/13/74	Hypertension II	16
11/27/74	Patient Histology Tissue Conference	4
12/4/74	Cardiovascular Surgery I	4
12/4/74	Cardiovascular Surgery II	1
12/11/74	Radiology	0
12/18/74	Technical Aspects of Dialysis I	8
12/18/74	Technical Aspects of Dialysis II	1
1/8/75	Cardiology Conference I	10
1/8/75	Cardiology Conference II	3
1/29/75	Pancreatitis I	14
1/29/75	Pancreatitis II	10
2/19/75	Blood Gases	3

The unforeseen popularity of these videotapes had a major impact on the evaluation in two areas. First, because of the informality of videotape use, it was impossible to gather accurate data describing this use. Second, some of the videotapes made their way into other VA hospitals which had been selected to serve as controls for knowledge gain evaluation fo the experiment. As a result, all the control hospitals were "contaminated" and were unable to serve their control function.

9.5 Impact

The post-experimental questionnaire contained a number of questions regarding the impact of the VA/ATS-6 experiment as a whole. Although the sample is not too large (302), the responses to these questions provide significant insight into both the viability of a satellite-mediated communication system for the VA and its possible impact.

To summarize responses to these questions we have "crosstabbed" them against the roles of the respondents to show the differences in responses by role. Each role is represented by a row in the table and by reading across the row it is possible to see how respondents from a particular role type answered a question. Response categories for the questions are listed across the top of the table and are shown as columns.

To interpret the table, first read the very last column. This gives the number of respondents from each role type and what percent of the total sample this group represents. In table 1, for example, there are 89 M.D.s and they represent 29.5 percent of the sample. Now read the bottom 2 rows. They give the number of respondents who selected each answer to the question. For example, in the first table, 41 people, or 13.6 percent of all respondents, answered "very much" to the question. Now look at one of the cells—row 3, column 4. It shows that 33 nurses answered the question with a "slightly" response. These 33 nurses are 22.4 percent of all the nurses who responded, they represent 42.3 percent of all people who responded "slightly" to this question, and they are 10.9 percent of the total sample. Note that the number in the lower right corner (302) represents the total number of people responding to this question and is the sum of the farthest right column and also the sum of the bottom row.

The first table deals with the success of the ATS-6 events in providing information to help solve existing problems. Across all roles, 67 percent indicated they felt the events had at least somewhat eased their problems. Nurses tended to be slightly more positive towards the experiment than were physicians.

Q. Considering all the problems in medical care that you are familiar with, to what extent do you feel that the ATS-6 programs solved or eased these problems?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	0	1	2	0	0	3
No Role Stated		0.0	33.3	66.7	0.0	0.0	1.0
		0.0	2.4	1.2	0.0	0.0	
		0.0	0.3	0.7	0.0	0.0	
	1	3	16	37	24	9	89
M.D.		3.4	18.0	41.6	27.0	10.1	29.5
		50.0	39.0	22.8	30.8	60.0	
		1.0	5.3	12.3	7.9	3.0	
	2	3	18	88	33	5	147
Nurse		2.0	12.2	59.9	22.4	3.4	48.7
		50.0	43.9	54.3	42.3	33.3	
		1.0	6.0	29.1	10.9	1.7	
	4	0	0	2	2	0	4
Admin.		0.0	0.0	50.0	50.0	0.0	1.3
		0.0	0.0	1.2	2.6	0.0	
		0.0	0.0	0.7	0.7	0.0	
	5	0	6	33	19	1	59
Other		0.0	10.2	55.9	32.2	1.7	19.5
		0.0	14.6	20.4	24.4	6.7	
		0.0	2.0	10.9	6.3	0.3	
	Column	6	41	162	78	15	302
	Total	2.0	13.6	53.6	25.8	5.0	100.0

The second table describes responses to a question probing the potential for satellite-mediated communications. In general, the respondents were quite positive about the potential (83.5 percent indicated they felt there was some potential and only 1.3 percent felt there was no potential). Again, nurses tended to be more positive than physicians.

Q. To what extent do you feel satellite communication (including the actual ATS-6 programs you have seen) has the potential to solve or ease these problems?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	0	0	3	0	0	3
No Role Stated		0.0	0.0	100.0	0.0	0.0	1.0
		0.0	0.0	2.1	0.0	0.0	
		0.0	0.0	1.0	0.0	0.0	
	1	2	30	38	17	2	89
M.D.		2.2	33.7	42.7	19.1	2.2	29.5
		14.3	27.8	26.4	53.1	50.0	
		0.7	9.9	12.6	5.6	0.7	
	2	10	49	77	10	1	147
Nurse		6.8	33.3	52.4	6.8	0.7	48.7
		71.4	45.4	53.5	31.3	25.0	
		3.3	16.2	25.5	3.3	0.3	
	4	1	1	2	0	0	4
Admin.		25.0	25.0	50.0	0.0	0.0	1.3
		7.1	0.9	1.4	0.0	0.0	
		0.3	0.3	0.7	0.0	0.0	
	5	1	28	24	5	1	59
Other		1.7	47.5	40.7	8.5	1.7	19.5
		7.1	25.9	16.7	15.6	25.0	
		0.3	9.3	7.9	1.7	0.3	
	Column	14	108	144	32	4	302
	Total	4.6	35.8	47.7	10.6	1.3	100.0

A surprising number (15.3 percent) of the respondents indicated they asked one or more questions in the events they attended. Physicians tended to ask more questions than did nurses.

Q. Did you ask any questions during the broadcasts you attended . . . approximately how many questions per broadcast?

	Count Row Pct. Col. Pct. Tot. Pct.	0	1	2	3	4	5	Row Total
	0	3	0	0	0	0	0	3
No Role Stated		100.0	0.0	0.0	0.0	0.0	0.0	1.0
		1.2	0.0	0.0	0.0	0.0	0.0	
		1.0	0.0	0.0	0.0	0.0	0.0	
	1	66	15	7	0	1	0	89
M.D.		74.2	16.9	7.9	0.0	1.1	0.0	29.7
		26.0	51.7	77.8	0.0	50.0	0.0	
		22.0	5.0	2.3	0.0	0.3	0.0	
	2	127	11	1	4	1	1	145
Nurse		87.6	7.6	0.7	2.8	0.7	0.7	48.3
		50.0	37.9	11.1	80.0	50.0	100.0	
		42.3	3.7	0.3	1.3	0.3	0.3	
	4	2	0	1	1	0	0	4
Admin.		50.0	0.0	25.0	25.0	0.0	0.0	1.3
		0.8	0.0	11.1	20.0	0.0	0.0	
		0.7	0.0	0.3	0.3	0.0	0.0	
	5	56	3	0	0	0	0	59
Other		94.9	5.1	0.0	0.0	0.0	0.0	19.7
		22.0	10.3	0.0	0.0	0.0	0.0	
		18.7	1.0	0.0	0.0	0.0	0.0	
	Column	254	29	9	5	2	1	300
	Total	84.7	9.7	3.0	1.7	0.7	0.3	100.0

When questioned concerning the value of the real-time interaction offered by satellite communication, slightly more than 50 percent felt it had some value, approximately 25 percent felt it had little or no value and the remaining 25 percent declined to respond.

Q. How valuable were the real time interactions?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	0	2	0	0	3
No Role Stated		33.3	0.0	66.7	0.0	0.0	1.0
		1.3	0.0	2.0	0.0	0.0	
		0.3	0.0	0.7	0.0	0.0	
	1	22	12	28	19	8	89
M.D.		24.7	13.5	31.5	21.3	9.0	29.5
		28.9	22.6	28.0	31.1	66.7	
		7.3	4.0	9.3	6.3	2.6	
	2	31	31	54	28	3	147
Nurse		21.1	21.1	36.7	19.0	2.0	48.7
		40.8	58.5	54.0	45.9	25.0	
		10.3	10.3	17.9	9.3	1.0	
	4	1	1	1	1	0	4
Admin.		25.0	25.0	25.0	25.0	0.0	1.3
		1.3	1.9	1.0	1.6	0.0	
		0.3	0.3	0.3	0.3	0.0	
	5	21	9	15	13	1	59
Other		35.6	15.3	25.4	22.0	1.7	19.5
		27.6	17.0	15.0	21.3	8.3	
		7.0	3.0	5.0	4.3	0.3	
	Column	76	53	100	61	12	302
	Total	25.2	17.5	33.1	20.2	4.0	100.0

When questioned concerning the degree to which they felt they had access to specialists and consultants in Denver via the satellite, the respondents were more negative. Only 49.6 percent felt they had some access, while almost 36 percent felt they had little or no access. This may, in part, be a reflection of the frustration expressed throughout the experiment over the lack of discussion time.

Q. To what extent do you feel you have had access to the specialist/consultants in Denver?

Count / Row Pct. / Col. Pct. / Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
0	1	0	0	2	0	3
No Role Stated	33.3	0.0	0.0	66.7	0.0	1.0
	2.3	0.0	0.0	2.7	0.0	
	0.3	0.0	0.0	0.7	0.0	
1	13	17	25	21	13	89
M.D.	14.6	19.1	28.1	23.6	14.6	29.5
	29.5	22.7	33.3	28.8	37.1	
	4.3	5.6	8.3	7.0	4.3	
2	20	47	32	34	14	147
Nurse	13.6	32.0	21.8	23.1	9.5	48.7
	45.5	62.7	42.7	46.6	40.0	
	6.6	15.6	10.6	11.3	4.6	
4	0	2	0	1	1	4
Admin.	0.0	50.0	0.0	25.0	25.0	1.3
	0.0	2.7	0.0	1.4	2.9	
	0.0	0.7	0.0	0.3	0.3	
5	10	9	18	15	7	59
Other	16.9	15.3	30.5	25.4	11.9	19.5
	22.7	12.0	24.0	20.5	20.0	
	3.3	3.0	6.0	5.0	2.3	
Column	44	75	75	73	35	302
Total	14.6	24.8	24.8	24.2	11.6	100.0

The next question probed the degree to which the satellite events had been able to create a sense of face-to-face interaction between the respondents and the Denver consultants. Nearly 53 percent of the respondents indicated they felt there was some success at creating this interaction. Nurses, again, tended to be more positive than physicians.

Q. We often get information from colleagues in a face-to-face situation. To what extent have the ATS-6 programs been able to create a sense of face-to-face interaction between you and the Denver consultants?

Count / Row Pct. / Col. Pct. / Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
0	2	1	0	0	0	3
No Role Stated	66.7	33.3	0.0	0.0	0.0	1.0
	4.4	1.5	0.0	0.0	0.0	
	0.7	0.3	0.0	0.0	0.0	
1	11	16	25	28	9	89
M.D.	12.4	18.0	28.1	31.5	10.1	29.5
	24.4	23.9	27.2	41.2	30.0	
	3.6	5.3	8.3	9.3	3.0	
2	21	37	48	28	13	147
Nurse	14.3	25.2	32.7	19.0	8.8	48.7
	46.7	55.2	52.2	41.2	43.3	
	7.0	12.3	15.9	9.3	4.3	
4	1	1	1	0	1	4
Admin.	25.0	25.0	25.0	0.0	25.0	1.3
	2.2	1.5	1.1	0.0	3.3	
	0.3	0.3	0.3	0.0	0.3	
5	10	12	18	12	7	59
Other	16.9	20.3	30.5	20.3	11.9	19.5
	22.2	17.9	19.6	17.6	23.3	
	3.3	4.0	6.0	4.0	2.3	
Column	45	67	92	68	30	302
Total	14.9	22.2	30.5	22.5	9.9	100.0

A significant proportion of the respondents did feel that pertinent information had been transmitted in the satellite events.

Q. To what extent do you feel that pertinent information was transmitted via ATS-6?

	Count / Row Pct. / Col. Pct. / Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
No Role Stated	0	1	0	2	0	0	3
		33.3	0.0	66.7	0.0	0.0	1.0
		3.6	0.0	1.7	0.0	0.0	
		0.3	0.0	0.7	0.0	0.0	
M.D.	1	5	37	35	9	3	89
		5.6	41.6	39.3	10.1	3.4	29.5
		17.9	28.2	29.2	50.0	60.0	
		1.7	12.3	11.6	3.0	1.0	
Nurse	2	17	64	63	3	0	147
		11.6	43.5	42.9	2.0	0.0	48.7
		60.7	48.9	52.5	16.7	0.0	
		5.6	21.2	20.9	1.0	0.0	
Admin.	4	0	2	1	1	0	4
		0.0	50.0	25.0	25.0	0.0	1.3
		0.0	1.5	0.8	5.6	0.0	
		0.0	0.7	0.3	0.3	0.0	
Other	5	5	28	19	5	2	59
		8.5	47.5	32.2	8.5	3.4	19.5
		17.9	21.4	15.8	27.8	40.0	
		1.7	9.3	6.3	1.7	0.7	
	Column Total	28	131	120	18	5	302
		9.3	43.4	39.7	6.0	1.7	100.0

In general, the respondents felt that viewing the VA/ATS-6 events was a good use of their time. Nurses were far more positive than physicians.

Q. To what extent do you feel that viewing programs (ATS-6 programs) was a good use of your time?

	Count / Row Pct. / Col. Pct. / Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
No Role Stated	0	1	1	1	0	0	3
		33.3	33.3	33.3	0.0	0.0	1.0
		1.7	1.1	0.9	0.0	0.0	
		0.3	0.3	0.3	0.0	0.0	
M.D.	1	21	18	35	11	4	89
		23.6	20.2	39.3	12.4	4.5	29.5
		35.6	19.4	30.4	44.0	40.0	
		7.0	6.0	11.6	3.6	1.3	
Nurse	2	29	59	50	5	4	147
		19.7	40.1	34.0	3.4	2.7	48.7
		49.2	63.4	43.5	20.0	40.0	
		9.6	19.5	16.6	1.7	1.3	
Admin.	4	0	1	2	1	0	4
		0.0	25.0	50.0	25.0	0.0	1.3
		0.0	1.1	1.7	4.0	0.0	
		0.0	0.3	0.7	0.3	0.0	
Other	5	8	14	27	8	2	59
		13.6	23.7	45.8	13.6	3.4	19.5
		13.6	15.1	23.5	32.0	20.0	
		2.6	4.6	8.9	2.6	0.7	
	Column Total	27	133	100	34	8	302
		8.9	44.0	33.1	11.3	2.6	100.0

In addition to stating that viewing the satellite events was a good use of their own time, respondents also indicated that they felt it was a good way for others to employ their time as well.

Q. To what extent do you feel that viewing programs (ATS-6 programs) was a good use of others' time?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	1	1	0	0	3
No Role Stated		33.3	33.3	33.3	0.0	0.0	1.0
		1.7	1.1	0.9	0.0	0.0	
		0.3	0.3	0.3	0.0	0.0	
	1	21	18	35	11	4	89
M.D.		23.6	20.2	39.3	12.4	4.5	29.5
		35.6	19.4	30.4	44.0	40.0	
		7.0	6.0	11.6	3.6	1.3	
	2	29	59	50	5	4	147
Nurse		19.7	40.1	34.0	3.4	2.7	48.7
		49.2	63.4	43.5	20.0	40.0	
		9.6	19.5	16.6	1.7	1.3	
	4	0	1	2	1	0	4
Admin.		0.0	25.0	50.0	25.0	0.0	1.3
		0.0	1.1	1.7	4.0	0.0	
		0.0	0.3	0.7	0.3	0.0	
	5	8	14	27	8	2	59
Other		13.6	23.7	45.8	13.6	3.4	19.5
		13.6	15.1	23.5	32.0	20.0	
		2.6	4.6	8.9	2.6	0.7	
	Column	59	93	115	25	10	302
	Total	19.5	30.8	38.1	8.3	3.3	100.0

When asked whether or not they felt viewing the experimental events increased their competence, nearly 60 percent of the respondents indicated that it had at least somewhat increased their competence. Only 7.3 percent felt that viewing had not increased their competence at all. Again, nurses (69.4 percent) tended to be much more positive than physicians (49.4 percent).

Q. To what extent do you feel that viewing increased your competence?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	0	2	0	0	3
No Role Stated		33.3	0.0	66.7	0.0	0.0	1.0
		3.1	0.0	1.6	0.0	0.0	
		0.3	0.0	0.7	0.0	0.0	
	1	7	17	27	25	13	89
M.D.		7.9	19.1	30.3	28.1	14.6	29.5
		21.9	32.7	20.9	37.3	59.1	
		2.3	5.6	8.9	8.3	4.3	
	2	19	26	76	25	1	147
Nurse		12.9	17.7	51.7	17.0	0.7	48.7
		59.4	50.0	58.9	37.3	4.5	
		6.3	8.6	25.2	8.3	0.3	
	4	0	2	0	2	0	4
Admin.		0.0	50.0	0.0	50.0	0.0	1.3
		0.0	3.8	0.0	3.0	0.0	
		0.0	0.7	0.0	0.7	0.0	
	5	5	7	24	15	8	59
Other		8.5	11.9	40.7	25.4	13.6	19.5
		15.6	13.5	18.6	22.4	36.4	
		1.7	2.3	7.9	5.0	2.6	
	Column	32	52	129	67	22	302
	Total	10.6	17.2	42.7	22.2	7.3	100.0

The last two questions concern the technical quality of the individual events and the quality of the intructional material presented. When asked if they felt the events were technically adequate, 81.5 percent of the respondents felt they were at least somewhat adequate and only 1.3 percent felt they were not technically adequate.

Q. To what extent do you feel that the ATS-6 programs were technically adequate?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	0	2	0	0	3
No Role Stated		33.3	0.0	66.7	0.0	0.0	1.0
		2.9	0.0	1.8	0.0	0.0	
		0.3	0.0	0.7	0.0	0.0	
	1	6	48	27	5	3	89
M.D.		6.7	53.9	30.3	5.6	3.4	29.5
		17.1	35.8	24.1	29.4	75.0	
		2.0	15.9	8.9	1.7	1.0	
	2	20	62	58	6	1	147
Nurse		13.6	42.2	39.5	4.1	0.7	48.7
		57.1	46.3	51.8	35.3	25.0	
		6.6	20.5	19.2	2.0	0.3	
	4	0	3	1	0	0	4
Admin.		0.0	75.0	25.0	0.0	0.0	1.3
		0.0	2.2	0.9	0.0	0.0	
		0.0	1.0	0.3	0.0	0.0	
	5	8	21	24	6	0	59
Other		13.6	35.6	40.7	10.2	0.0	19.5
		22.9	15.7	21.4	35.3	0.0	
		2.6	7.0	7.9	2.0	0.0	
	Column	35	134	112	17	4	302
	Total	11.6	44.4	37.1	5.6	1.3	100.0

When asked if they felt the topics were covered comprehensively by the events, 76.8 percent of the respondents indicated they felt they were covered at least somewhat comprehensively.

Q. To what extent do you feel that topics (in the ATS-6 programs) were presented comprehensively?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	2	0	1	0	0	3
No Role Stated		66.7	0.0	33.3	0.0	0.0	1.0
		5.6	0.0	0.8	0.0	0.0	
		0.7	0.0	0.3	0.0	0.0	
	1	7	35	35	11	1	89
M.D.		7.9	39.3	39.3	12.4	1.1	29.5
		19.4	32.7	28.0	33.3	100.0	
		2.3	11.6	11.6	3.6	0.3	
	2	19	55	60	13	0	147
Nurse		12.9	37.4	40.8	8.8	0.0	48.7
		52.8	51.4	48.0	39.4	0.0	
		6.3	18.2	19.9	4.3	0.0	
	4	0	1	2	1	0	4
Admin.		0.0	25.0	50.0	25.0	0.0	1.3
		0.0	0.9	1.6	3.0	0.0	
		0.0	0.3	0.7	0.3	0.0	
	5	8	16	27	8	0	59
Admin.		13.6	27.1	45.8	13.6	0.0	19.5
		22.2	15.0	21.6	24.2	0.0	
		2.6	5.3	8.9	2.6	0.0	
	Column	36	107	125	33	1	302
	Total	11.9	35.4	41.4	10.9	0.3	100.0

Another measure of program impact was developed from questions asked in the full retrospective questionnaires. These questions are listed below.

Which of the programs did you see?

Which of these programs have you discussed with your colleagues?

Have you been able to use any of the material presented in these programs in your job? Which programs?

Have you tried to obtain additional information on subjects covered by any of these programs? Which programs?

Have you made any changes in the way you perform your job because of information presented in any of these programs? Which programs?

These questions were asked in three retrospective questionnaires covering 42 programs, generating a total of 5561 viewer experiences (viewer experience=1 person viewing 1 program). By "chaining" together the responses to these questions in a series, we can gain some insight into the potential impact of this form of programming.

To begin, we look across the questions to see that of those who saw the events (5561 viewer experiences), 44 percent indicated that they discussed the program material with colleagues, 41 percent indicated they used material from the events in the performance of their jobs, 24 percent indicated that they sought additional information on topics presented, and 16 percent indicated that they changed the performance of their job because of information presented in the programs.

Next we consider those individuals who both saw events and discussed them with their colleagues (2457 viewer experiences). Of the people who fell into this category, 53 percent indicated that they used information presented in the programs, 30 percent indicated that they sought additional information on the topics presented and discussed, and 24 percent made changes in their job performance based on information learned and discussed.

Carrying the chain of behaviors one step further, we next examine those people who saw the program, discussed it with their colleagues, and obtained additional information on the topics. Of these, 77 percent indicated that they used the information in the performance of their jobs and 47 percent stated that they made changes in their job performance as a result of this information.

Since these chained behaviors represent self-selection, they must be viewed carefully. They suggest what might happen under optimal conditions, not what can happen as the result of a structured program. In general, if people view the events and if they then feel moved to discuss the information presented in these events with their colleagues, the probability is fairly high that they will use the information (53 percent). If, in addition to discussing the program with colleagues, they seek out additional information, the probability that they will use the information jumps to 77 percent.

Again we caution that no causality is implied here. The data does not allow us to determine if the adoption of new information was based on some need which existed prior to the program or whether it was, indeed, a case of some totally new information presented in the program and forming the base for traditional adoption behavior. What these data do suggest, however, is that given the right conditions, events of the type presented in these events can have a significant impact and can trigger an information-adoption pattern.

9.6 Technical Problems

Technical problems were present throughout the project. Comments on at least 30 events complained about poor audio and, less frequently, about loss of video signal. Site visit reports also indicated frequent audio problems. However, it appears from the pattern of these reports that the problems did not appear in all hospitals at the same time, suggesting that the technical problems were at the receiving rather than at the broadcast end. Also, many of the hospital viewing rooms had very poor acoustics, which further complicated the problem, both when receiving the events and when asking questions.

9.7 Scheduling Problems

There were some scheduling problems, caused primarily by time constraints and production problems encountered in some of the programs. This meant that the original ten-month schedule had to be corrected with monthly updates which were sent out around the middle of the preceding month. Although this provided the hospitals with two—three weeks warning of schedule changes, it did cause the hospitals some distress—particularly in their community relation programs which encouraged area physicians to attend the broadcasts.

While this may seem a minor problem, many of the hospitals did have strong community interest in the experimental events and frequently had large numbers of non-VA attendees.

The actual broadcast schedule created problems as well. In several hospitals it conflicted with long-established meetings that could not be rescheduled. Also, many staff members who wished to be present for the broadcast could not because they were on duty and could not leave. Obviously no single time would be best for all viewers, however it seems obvious that future experiments or events should have some arrangement for multiple scheduling.

9.8 Printed Material

One problem which was mentioned briefly in the discussion of grand rounds was the frequent absence of printed material to accompany the programs. Rescheduling sometimes caused problems in getting printed material to the hospitals in time for the video seminars. Comments from the hospitals indicated that they preferred to get the printed material in advance so staff members could prepare for the programs, yet the material often was not available until the day of the program (sometimes even later). Another frequent complaint was that there were not enough copies of the printed material.

Although no printed materials were prepared for the teleconsultations or grand rounds, there were frequent complaints about the lack of it. Perhaps, the impact of the events would have been greater had such material been available. This problem was particularly acute among nurses watching physician oriented programs. They were highly motivated and interested in the material, but found much of it very difficult to understand. Some sort of preparatory material might have significantly increased the impact of the events on them.

9.9 Post-experimental Impressions

A post-experimental questionnaire was distributed during the last program of the series to collect impressions towards the project as a whole. One question of particular relevance asked the number of ATS-6 events the respondent had seen at time of broadcast and the number seen later via videotape. The following table shows by hospital the number of respondents who completed the questionnaire, the mean number of programs seen at broadcast time by each respondent, the number of respondents who reported viewing videotapes of the broadcasts, and the mean number of videotapes each of these respondents viewed.

Hospital	Respondents	Mean Programs At Broadcast	# Viewing Videotapes	Mean Tapes Viewed
Altoona	20	20.85	11	21.9
Asheville	40	10.18	13	2.85
Beckley	28	8.18	16	2.69
Clarksburg	20	19.65	9	4.67
Dublin	26	22	16	9.13
Fayetteville				
Mt. Home	52	13.64	24	2.92
Salem	33	12.09	8	8.75
Salisbury	34	16.09	12	10
Wilkes-Barre	49	16.57	26	7.73

These respondents were obviously self-selected (as were all respondents) and were in general very pro-ATS-6. Regardless of the self selection bias, however, it is apparent that there is at least a hard core of very avid users of the experimental programs. To get some feeling for their impressions of the experiment, the following comments have been selected from the questionnaires.

Q. Why did you attend programs?

"Interest in subjects and also interest in the project"—nurse (all programs)

"I was project coordinator"—nurse (all programs)

"Because in this area most other forms of CT (continuing training) are dull lectures. I need CT badly in all fields and because I found most of your programs very interesting."—physician (55 programs)

"Saw most of the programs in our library from 7 to 8 in mornings because the volume of patients demand all my time in my office . . ."—physician (26 programs)

"I felt I learned from them"—physician (8 programs)

"I enjoyed the exchange of information and new ideas and reviewing old methods, even though we are not equipped or staffed to handle some of the more sophisticated methods"—nurse ("many" programs)

Q. Describe ways in which you perform your job differently because of an ATS-6 broadcast . . .

"Unlike before, I do not take elaborate tests, time and efforts to determine the cause of hypertension in patients now. I realize the treatment and prevention of complications is what is really important. Also, I now use the three classes of hypertension drugs, as the particular case needs"—physician (48 programs)

"A patient with anemia was being studied at the time of the program on anemia—the points made on the program were directly utilized in managing the patient"—physician (45 programs)

"No way"—physician (15 programs)

"Actual job performance was not changed. Assimilation of significant and practical aspects of broadcasts into the overall performance was virtually automatic and probably contributed markedly to the efficiency and efficacy of the guidance provided by a Chief of Staff"—physician (50 programs)

"In process of changing catheter care. Presently evaluating various closed drainage systems before initiating a new procedure"—nurse (50 programs)

"I was able to help at least one patient who was dying and knew for certain that he was dying."—nurse (22 programs)

"Sengstaken tubes—using iced saline, reassuring the patient, etc. We are in the process of revising our urinary drainage procedure and have drawn material from that program"—nurse (41 programs)

"None"—physician (20 programs)

"The approach to COPD breathing at bedside has been modified slightly"—physical therapist (11 programs)

"I can think of none. There were new ideas which I can recall, but the nature of illness of most of our patients is such that little if any change in dealing with them is of value. The majority of our acutely ill patients are transferred to acute centers for treatment. The majority remaining are long-term chronically ill and alcoholic. Methods used in treatment of the alcoholic have been inadequate"—nurse ("many" programs)

"I seriously consider transferring stroke patients to rehabilitation centers rather than nursing homes"—physician (8 programs)

"Tried to refrain talking any more than necessary in the operating room"—nurse (40 programs)

"None—except to brag about the program in an attempt to improve the community image regarding the Veterans Administration"—physician (26 programs)

"I am less depressed because my work, which is overwhelming, is 'interrupted' by this beautiful program—so I go back refreshed"—physician (55 programs)

Q. What do you feel are the major strengths of satellite communication for medical care within hospitals?

"Two way communication on selected medical problems. Also the study guides reinforce the information"—physician (48 programs)

"Subject material dealt with is that which is being currently used in the hospital where we work"—physician (10 programs)

"Immediacy of communication; variety of speakers and consultants; and ability to transmit technical data"—physician (45 programs)

"Ready accessibility to recent developments in diagnosis, treatment and management of selected, essentially common disease. Opportunity to discuss with expert consultants questions and clarification of obscure points in presentations. Visualization of techniques, patients, summaries, etc. that reinforce memory retention. Conservation of travel time and costs involved in attending similar programs, seminars, etc."—physician (50 programs)

"Entire staff, Dr., RN's, LPN's, etc., all see the same programs—new trends, etc. Easier to to apply and use new techniques learned and easier to get doctors to order new things if they have seen it work via satellite"—nurse (2 programs)

"To communicate new ideas from hospital to hospital; to promote more feeling of teamwork with VA hospitals; and to give opportunities to meet and know fellow VA personnel"—other (10—12 programs)

"Visual aid very effective; authorities on the subject matter; and all programs have major VA backgrounds and are pertinent to care of VA patient"—nurse (10 programs)

Q. What do you feel are the major weaknesses of satellite communication for medical care within hospitals?

"The busy schedules of personnel, especially doctors, did not allow them to attend the programs as they would have wanted to"—physician (48 programs)

"Small talk—local showmanship"—physician (20 programs)

"Expense of program probably far exceeds gains to be realized"—other (15 programs)

"All hospitals are different; one may not be operated like another, hindering duplication of ideas. All hospitals do not have staff like Denver or Chicago have; e.g., colostomy specialty nurses"—Other (10—12 programs)

"The program (2 hours) was too long a time for staff to be off the work area—also 1 o'clock is one of the busiest work periods in the day"—nurse (7 or 8 programs)

"In some instances, the only benefit derived was a personal benefit from hearing specialists in given fields. We are unable to implement many of the suggestions and ideas due to limited facilities and staffing"—nurse (3 programs)

"Do not get indepth expert consultations"—physician (8 programs)

"Too much time spent in communication between panel callers and answers were not included in a booklet to supplement program"—nurse (33 programs)

"Material not furnished on all programs. Need to specify who the program applies to"—nurse (20 programs)

"Pre-planned and no choice in subject topics. Not adequate time for questions and answers. Would appreciate written copy forwarded to each station of questions and answers for future and deeper study"—nurse (10 programs)

"The rigidity and lack of continuity so far. The 'one shot' broadcasters seem tense and some viewers seem stimulated too late. Brief follow-up broadcasts might be worthwhile—like continuing series on a topic"—other (12 programs)

"Too much time spent on question and answer session. Too much time spent in presenting material from different hospitals—some was very poor material"—physician (50 programs)

Q. Please list any specific knowledge you have gained from ATS-6 programming that has been useful to you in performing your job.

"The practical approach to treatment of hypertension; management of anemias; and a better understanding of cardiac arrhythmias and unstable angina and their management"—physician (48 programs)

"Better knowledge of arrhythmias, etc. The program on sergstaken tube—that knowledge has probably been used the most by me"—nurse (3 programs)

"Much—including about scapular spasticity (care of the stroke patient); how patients are taught to colostomize themselves; how patients undergo carotid arteriography and the benefits of diagnosis in this procedure"—other (10—12 programs)

"I now understand more about colon disorders and learned about the use of feteraptics in diagnosing colon lesions. I enjoyed the one that discussed O.R. patient that could hear while under general anesthetic"—nurse (20 programs)

"Management of cirrhosis and the liver; coronary disease, and many others"—physician (50 programs)

Q. What effect do you think the ATS-6 experiment has had on communication patterns within the hospital staff?

"Fostered an increased participation by staff members in personal interchanges that clarified many of the problems encountered by these members and resulted in ultimate resolution of, at least, a reasonable percentage of the difficulties"—physician (50 programs)

"Very effective. Staff enthusiastic—well represented by most of hospital services"—nurse (10 programs)

"Has definitely enhanced communications via teamwork approach on ATS programs"—other (10 programs)

"Salubrious"—physician (2 programs)

"Interfered with usual communication patterns, especially after the novelty paled"—physician (24 programs)

"Better between me (physiciatrist) and all other services (except psychiatrists)"—physician (55 programs)

Q. In what ways do you feel there will be any continuing or long-term effects from the ATS-6 experiment.

"All the knowledge we have gained is stored and will be recalled as we encounter problems; added to the rest of our knowledge and used to better care for our patients"—nurse (3 programs)

"Continual total assessment by the patient care team. Continued interest in professional performance through analytical thinking and interdisciplinary approach to problem solving. Increased motivation for use of sources. Recognition of need to develop research skills"—nurse (45 programs)

"ATS-6 teaches personnel about different phases of hospital care—knowing this contributes to giving quality care to each patient"—other (10—12 programs)

Q. If another satellite were available for VA use, what aspects of the current experiment would you like to see repeated?

"Program it back to us—sooner"—physician (55 programs)

"All of the various approaches used in transmission had something of value to contribute. If a personal priority were desired, the seminar format would be given the highest desirability rating; this would be followed by the grand rounds and teleconsultation formats, in that order of decreasing preference. As noted in preceding, each broadcast had something to contribute, irrespective of format. Planning was excellent and one would be somewhat presumptious to suggest any radical change in the experimental design"—physician (50 programs)

Q. What aspects would you like to see changed?

"Content—boring. Approach—it should not be a single taped grand rounds. Use color"—physician (15 programs)

"I would like to see more on the subject of anesthesia, its special problems as related to alcoholism, why one type of anesthetics is preferred to another due to patients special problems and most important—a thorough medical and laboratory workshop prior to"—nurse

"More discussion about the specilities (selected topics) in hematology rheumatology, infectious disease, and nephrology"—physician (50 programs)

"Avoid broad coverage—stick to narrow specific problems"—physician (24 programs)

9.10 Cost and Utility

As is typical with most experiments, a large portion of the costs of this project was devoted to experimental equipment and other types of "trail blazing" which would not be typical of an operational system.

Using the total cost of the experiment it is possible to at least provide some cost/utility figures for different aspects of the experiment. Of course, these figures could be very misleading, since they are based on an experimental rather than an operational system.

The cost of the experiment was approximately one million dollars which, if spread equally among the 69 events, comes to $14,492.75 per event. If we divide this amount by our estimated number of viewers per event (400 at time of broadcast) we arrive at a cost of $36.23 per viewer experience. If we add in an estimated 400 viewers who saw the event via videotape, then the cost per viewer experience drops to $18.12. This, of course, reflects only the ten experimental hospitals. The videotapes were also distributed to other hospitals—both VA and non-VA—so the actual impact of each event spread far beyond the ten hospitals. The cost per viewer experience is probably far lower than the above estimated costs (although we were unable to calculate it).

In addition to the cost per viewer experience, we can also project some measure of the impact on viewers of each event. Based on responses to the retrospective questionnaires (discussed in subsection 9.5) we have projected that approximately 43 percent of those who view a program will use some of the information presented in that event in the performance of their job. From this, we can project that one

event could directly impact the job performance of at least 172 viewers (assuming 400 viewed the broadcast) for a cost of $84.26 per viewer. The retrospective questionnaires did not discriminate between viewing the programs at time of broadcast and viewing them via videotape. However, if the projections hold for videotape as well as for live presentation, then this cost estimate could easily be cut in half.

Another cost utility measure can be developed from data collected via the post-experimental questionnaire. The 302 respondents to that questionnaire had viewed an average of at least 15 events—obviously a "hard core" of highly motivated viewers. It seems safe to assume that at least half of these respondents will function as gatekeepers or opinion leaders—passing information gained on to colleagues and to others they contact in their work. Although we are not aware of any studies of the impact of gatekeepers in a hospital setting, the research literature does suggest that social processes are a significant factor in the diffusion of new medical information. A small number of opinion leaders from a variety of different roles and specialties could then have a very great impact on the provision of medical care. Obviously this has an effect on the cost/ratio. While $36.23, or even $18.12, may seem a high cost for a single viewer experience, if that viewer is an opinion leader, the utility of the investment may be increased by a significant amount.

Conclusions

After reviewing the mass of data collected to evaluate this experiment, particularly the comments offered by respondents both on questionnaires and to on-site interviewers, it is apparent that the main outcome or product of this experiment was intangible. This outcome could best be described as a kind of gestalt that gradually appeared over the course of the experiment.

Like any gestalt, this one cannot be completely explicated. However, we can describe some facets of the gestalt that we did observe.

1. A feeling on the part of the medical personnel that they were not isolated—that there was somebody there.
2. A sense of identity with other VA hospitals—an awareness of common experiences and common problems.
3. A sense of team identity that appeared to bring physicians and nurses (and allied health professionals) closer together; that made them aware that they were part of a team.
4. An awareness of the need for a continuous inflow of information to provide stimulation for the mind.
5. A new awareness of the availability of information and an easing of the barriers to information seeking.

The impact of this gestalt was considerably greater than the impact of any individual event—perhaps larger than the impact of the total contents of all the events. It "created the space" or provided the climate in which it was possible to effect changes, not only in medical care practices and techniques, but more importantly, in the attitudes and behaviors of individual staff members.

The "live" quality of the video presentations was probably the major contributing factor to this gestalt. Viewers were aware that the programs were focused at them and that it was possible for them to ask questions and get a response in "real time." While few people availed themselves of the opportunity to ask questions "on the air," the fact that they could if they wished had a great impact on them.

The second most important factor contributing to this gestalt was probably group viewing. Viewing events together with physicians gave the nurses a sense of equality and greatly increased their self image. They began to view themselves as team members, rather than as subordinates. (This was probably also due in no small part to the five-part series on the Changing Role of the Nurse broadcast early in the experiment.)

A third major contributing factor was an awareness on the part of the viewers of the other participating hospitals. Through questions and via the teleconsultation events, viewers became aware of the other hospitals and could see that they were not alone or unique and actually had much in common with other VA hospitals.

How long this gestalt will continue after the conclusion of the experiment is an interesting question which should perhaps be studied at some future time. Whether this gestalt can remain without the constant support of the VA/ATS-6 events (and for how long) remains to be seen.

Our second conclusion concerns the environment within which the experiment was conducted. As we noted earlier, there was considerable variance between hospitals in the way the VA/ATS-6 experiment was supported. Certainly the experiment could not be all things to all people (or to all hospitals). Some hospitals got more than they expected; others were disappointed. It was our observation, however, that, as with most things, the rewards the hospitals got from the experiment were directly related to the effort and support they put into the experiment. The gestalt we discussed earlier affected all hospitals, but it was much more apparent in some than in others. It would appear that administrative support and enthusiasm were significant factors affecting the overall impact of the experiment on the individual hospitals.

Our next area of discussion concerns the impact on viewers of the program material. In evaluating the impact of educational material on a population, it is traditional to attempt to measure behavior change. It is important, however, to be aware of the problems involved in trying to prove causality, i.e., that exposure to specific information did cause (or did not cause) a change in behavior.

First, it is important to remember that it is impossible to control or even identify all the variables affecting a field experiment. Thus, although a subject may be "exposed" to a message, it is almost impossible to prove that a specific exposure caused the specific behavior change. How do we know, for example, that the subject had not received the same information previously? How do we know that subsequent exposures to the same information did not occur? Also, how can we prove that there was indeed long-term behavior change, rather than simply a response to a slightly different set of conditions. A new drug prescription, for example, might be based on observation of a different set of symptoms rather than on new information received.

It would be extremely naive to assume that a particular "chunk" of information presented in one event could create behavior change. What actually happens is that this chunk is combined with other chunks of information already "stored" by the individual. At some time in the future, a certain set of circumstances activates this chunk of information which, together with other chunks (acquired both before and after the acquisition of our particular chunk), generates a specific behavior.

Another way of viewing this problem is to divide information into two basic types—"nutrient" (adding to the general store of information "on call" but not applicable to any specific situation) and "application" (bearing on a specific problem or situation). Most of the information provided by events in this experiment is nutrient information—it is stored together with other nutrient information obtained from other sources.

Sometimes, however, enough nutrient information is gathered on a particular topic to create a critical mass (usually in the form of an idea or a question) which then triggers the seeking of application information for that particular topic. As a result of application information collected, alternative courses of action are formulated, and one may be selected, thereby resulting in behavior change.

Nearly all continuing education material provides primarily nutrient information. The closest we can tie such information to specific behavior changes is to show that changes related to the content of a program occurred after exposure to that event.

For example, many respondents reported changes in techniques associated with catheterization. One of the event broadcasts dealt with this topic, yet nobody reported changing behavior based only on information from this event. A typical comment would be that as a result of the event viewers were aware that present techniques were inadequate and that they were in the process of evaluating alternative techniques to select a new one. Obviously the event contributed to the behavior change, but additional information was required before the change was made.

In evaluating the impact of these events then, the most we can say is that in many self-reported cases events appear to have contributed to specific behavior changes. Many of these instances have been described in subsection 9.9. Overall, the impact appears to have been significant. A large number of behavior changes were reported, both by respondents and via site visit reports, in areas that were covered by the event material.

Some specific changes were identified by Dr. Roger Hamstra, physician moderator for the broadcasts, in a post-experimental visit to four hospitals to assess event impact. Several examples from his reports are cited below.

> One physician recalled a point that was made in the urinary tract infection and catheter care program—that a patient with chronic bacteriuria and chronic pyurea without symptoms does not necessarily need to be treated with an antibiotic. The physician then described one case (which Dr. Hamstra verified from the patient's records) where a patient with a positive urine culture with a significant bacteria count was not placed on antibiotics.

> A medical resident at one hospital reported that while he was not aware of any changes in patient management, he did feel the professional enrichment he received from the programs he viewed was significant. A vigorous discussion between himself and the chief of cardiology followed the program on cardiac arrhythmias, for example. In addition, he was motivated to read a certain number of papers dealing with the same subject to compare the results of those papers with the opinions on the broadcast.

> By reviewing log books with a chief of pathology, Dr. Hamstra was able to detect a change in the frequency of ordering serum folate, serum B-12 and serum renin levels. (A program on anemia had encouraged greater use of B-12 and folate determinations, while the program on hypertension and discouraged the use of serum renin determinations.) During May of 1974 there were three B-12 measurements, eight folate measurements and two renin measurements. In May, 1975 (after the programs) there were twenty-eight folate measurements, forty-five B-12 measurements, and one renin determination.

> Another hospital record check indicated a dramatic increase in the ordering of arterial blood gas tests—up from one in May, 1974 to 55 in May, 1975. Between those two dates, a number of satellite programs dealt with lung disease, pulmonary emboli and the value of arterial blood gas tests.

> A cardiologist reported that he had significantly decreased his requests for serum renin determinations after viewing the program on hypertension. He also reported that he had developed a number of ideas and modifications based on material he learned from the programs. One example he cited (verified by Dr. Hamstra from the records) was increasing the length of time for leaving a transvenous pacemaker from two-to-four days to seven days or more. He also reported using high dosages of procainamide for patients with quinidine resistant ventricular disrhythmia problems, again based on information from the VA/ATS-6 programs.

> One physician reported that since viewing the program on shizophrenia he is using haldol rather than valium to quiet patients with degenerative brain disease.

> A nurse in an intensive care unit reported that in her unit catheter systems are now used in a closed pattern in that when urine cultures are required, they are obtained with a syringe and needle as recommended in the VA/ATS-6 program.

> An inhalation therapist and laboratory technician for blood gases reported that in developing a procedure book for his area he had used the study guide on arterial puncture very extensively. He also reported that he does at least four or five blood gas studies per day.

11. Summary

1. The experiment, as a whole, had a significant impact on the experimental hospitals.
2. This impact spread to other hospitals via videotapes of individual events.
3. The major impact was the creation of a gestalt which facilitated increased information seeking, improved morale, and created an environment which facilitated innovation.
4. Nurses seemed more receptive to the programming than did physicians.
5. Video seminars were the most popular form of event, although out-patient clinics might have been first, had more been presented. (Only three OPS were presented which was insufficient for complete evaluation.)
6. The grand rounds format also has great potential. However, it would probably be better if the events originated at hospitals rather than from a central location.
7. Satellite-mediated teleconsultation appears to have great potential. Unfortunately, the ten events used to test teleconsultation potential were limited by the available technology (only one-way video was available) and the presentations were more in the nature of grand rounds than one-to-one teleconsultations.
8. Reactions to the slow scan technology were mixed. Color would have helped, but many consultants felt picture transmission was slow enough to interfere with the consultation.
9. The two computer events were inconclusive. Both events appear to have been well received but technical problems obscurred whatever qualities the software might possess.
10. The use of videotaped events was extremely widespread and effectively increased the use of the event material by an order of magnitude.
11. Although videotapes of the events were used extensively, the live quality of broadcasts, together with the interaction, was the major contributor to the gestalt the experiment created.
12. The mixed viewing of the events (physicians, nurses, and allied health personnel in a common room) was a significant contributor to the gestalt created by the experiment.

Section VI:
Summary and Conclusions

SUMMARY

During a 44-week period, from July 10, 1974 to May 19, 1975, 69 programs, divided among five experimental events, were broadcast over ATS-6 to ten Veterans Administration hospitals in the Appalachian Region. Each hospital was provided with a telephone linkage to a Denver television studio where programs originated, so that two-way interchange was possible during all broadcasts. For one experimental event, the teleconsultations, the hospital from where the consultation originated also was equipped with a slow scan video compressor so that visual information could be transmitted to the Denver studio.

The overall goal of the experiment was to determine whether satellite-mediated communications have a place in the Veterans Administration health system. The importance of a free-flow of information throughout this enormous system has been recognized. The ability to communicate is vital to the management of the system, and to the assuagement of feelings of isolation among the professionals working in remote facilities.

The question asked in this study was: are the capabilities of communications satellites sufficiently unique, diverse, and cost-effective, as compared with traditional carriers of electronic messages, to warrant participation by the Veterans Administration on future, more permanent communications satellites?

Evidence Provided by the Experiment on ATS-6

Perhaps the most significant indication of the potential use of satellite communications throughout the VA system was the way in which the weekly ATS-6 broadcasts were regarded in the ten participating hospitals at the end of the experiment. Although participants had been asked to regard the broadcasts as experimental rather than as a service, by the end of the 44 weeks, the regularly scheduled programs had generally come to be thought of as a useful service. When the final telephone survey was taken at the end of the last broadcast, coordinators asked when the broadcasts would begin again. Several wanted to know whether their hospital would receive programs on "the next satellite."

Over the broadcast period, the programs, with the exception of the teleconsultations, continued to attract about the same number of participants in the various hospitals. Professionals continued to attend the weekly broadcast long after the novelty factor was no longer in effect, possibly an indication that an expectation of a well-produced program on a timely subject, with an opportunity to ask questions, will always attract an audience.

More than simple attendance records, there were many inputs from the hospitals indicating that programs had met the objectives set for them: they had resulted in knowledge gain,

attitude change, and even behavioral changes resulting in better patient care outcomes. Patient records, given to the physician moderator of the programs during hospital visits after the broadcast period, indicated several instances where patient care had been altered following procedures recommended in a VA/ATS-6 broadcast. And generally speaking, the evaluation data indicated a change of "climate" or "gestalt" in the participating hospitals, a change that resulted in more willingness to accept new information and to change methods of practice accordingly.

The programs broadcast on ATS-6 for the experiment in health communications were apparently successful in achieving their purpose—and more. The question remaining is: Could these same outcomes have been achieved using a less exotic mediator than an expensive satellite?

In a monograph publication by the Rand Corporation,[1] two types of communications are said to justify the use of live broadcast by satellite: (1) late news and special events; and (2) those in which two-way interaction is an integral part. Both of these factors were taken into consideration in designing the broadcast schedule for the VA/ATS-6 experiment. All programs selected incorporated timeliness and therefore the need for two-way interaction. When the evaluation data are examined, it appears that these two-way factors were significant to the acceptance of the programs and to the general regard of the regular broadcast as a service rather than as an experiment on the part of the ten participating hospitals.

The Satellite as Mediator

Although the two justifications given for using a satellite to broadcast programs were integrated successfully into the five experimental events, it is questionable that a satellite was essential for accomplishing the broadcast of two-way programs on a regular, weekly basis to ten hospitals in Appalachia. It is true that the ten hospitals are located in geographically isolated areas; but had the Veterans Administration been able to underwrite the costs of providing traditional linkages, the ten hospitals could have been connected by microwave to receive closed-circuit television signals. The return linkage for two-way discussion would be provided by telephone line, as it was for the experiment. Most of what was accomplished in the way of education and provision of information during the VA/ATS-6 experiment could, therefore, have been achieved without the use of ATS-6.

But the intent of the VA/ATS-6 experiment was not to find whether a communications satellite could replace traditional linkages for ten hospitals spread over a small area. It was, rather, to find whether the satellite could transmit signals, at least as clearly as traditional mediators, to inexpensive receivers located in geographically isolated areas. If it could reach these satisfactorily, the satellite could also transmit to facilities in all other locations. It could then potentially become the means of interconnecting a geographically wide-spread, vast group of facilities for purposes of: (1) management; (2) education; (3) consultation; and (4) diagnosis.

The ATS-6 was successful in transmitting a clear audio and video signal, as well as computer information, to the ten participating hospitals, reliably, for nearly a year, with very little maintenance required for receiving equipment. For this reason it is possible to arrive at some conclusions about the future use of satellites throughout the Veterans Administration health system.

CONCLUSIONS

The unique feature of a communications satellite is its ability to provide an electronic linkage among many facilities located over a large geographic area. A high powered satellite, such as ATS-6, has the ability to provide clear transmissions to inexpensive receivers in almost any domestic location. Based upon this information, many individuals have conceived of equally as many possible systems designs for using satellites coupled with other media for communications and education. The following concept, based upon similar knowledge plus the experience derived from the designing and implementing the VA/ATS-6 experiment, is one conception of how a satellite might be utilized in providing an informational network for the Veterans Administration's 383 health facilities.

The Future: A Satellite-Mediated Communications Network for Veterans Administration Health Facilities

Some communications needs of the VA's large system of hospitals, clinics and other facilities are: (1) an overall system of patient management, from systemized, high standards of care to efficient utilization of resources; (2) a means of providing two-way access to continuing education at times and places convenient to the practitioners; (3) a linkage to specialists, accessible at any time to physicians and nurses and other professionals; and (4) a mechanism for providing wider usage for special diagnostic equipment, so that one such piece of equipment could serve many facilities.

The Communications Linkage

A satellite-mediated network, linking all 383 VA facilities throughout the United States could serve many uses in meeting these four general needs. All or some of the 383 facilities might each be equipped with a transceiver, capable of receiving and sending signals via satellite to and from a central location, and to and from each other. Thus equipped, the VA satellite network would have the potential for an infinite variety of communications. The intent would be to make available to all facilities the specialized knowledge developed at various VA centers, as well as to tap the resources outside the VA when appropriate.

To make the most efficient use of scarce resources, the VA centers specializing in diagnosis, treatment and care of certain diseases could become instructional centers for other hospitals. Also the nationwide network could be divided into smaller regional networks when appropriate. Any facility within the region could potentially become an instructor for its neighbors; and any facility could also serve as a center for its community for receiving two-way instruction from other facilities.

Communications Center

The informational core of a future National VA Satellite System might be a building, or complex, housing a variety of special facilities and equipment: among them: a computer, television production and broadcasting facilities; and special diagnostic devices capable of measuring physiological manifestations, electronically, without regard to distance.

Along with these mechanical devices, the complex would also include people: specialists in fields ranging from cardiac disease to library sciences. The specialists, aided by machines, would form systems for providing information, when needed, for the VA facilities to meet the four general communications

needs of management, education, consultation and diagnosis. Some possible specific ways these systems might meet these needs will be described in the following discussion.

Patient Management. The Problem Oriented Medical Record (POMR) has already been introduced to the Veterans Administration health care facilities. Potentially it will become a means of ascertaining that patients receive consistent, high-quality medical care in all VA hospitals. When generally accepted, the POMR will facilitate treatment of patients by the various services, because team members will be able to refer to it, know what has been done for the patient and what remains to be done. It will also facilitate the transfer of patients from one facility to another; potentially it will mean a more efficient use of available resources throughout the VA health system.

The POMR method of patient management will probably achieve its greatest potential for setting and maintaining high standards of patient care throughout the VA when it is incorporated into a computerized system that also includes patient care standards that are continuously updated, a review mechanism, and a means for providing continuing education and in-service training when needed.

The central, computerized maintenance of POMR's, plus their review and provision for continuing education could be a major operation of the Communications Center. The computer, linked by satellite to all facilities, would continuously update standards of practice or procedures for the disease categories seen in VA facilities. It would be up to the individuals practicing in the facilities to acquaint themselves with updated standards, and to participate in continuing education programs about new techniques and methods of care when needed. A computerized review mechanism, overseen and coordinated by a peer group assigned the task of standards review for one facility—or several facilities—would ascertain that established standards of practice are adhered to in each hospital. When some aspect of care is substandard in a hospital, intensive educational courses might be provided to bring practitioners up-to-date on the current standard of practice they are expected to follow. If one individual is repeatedly found to be practicing below the level expected of him or her, that individual might be asked to appear before the review group to discuss an acceptable means of changing his behavior.

This course of action, from the establishment of standards of practice through medical audit and remedial action and re-audit follows the procedure recommended by national legislation amending the Social Security Act to require Professional Standards Review Organizations (PSRO) or some other method of Utilization Review for audit of hospital records. Hospitals must comply with the review requirement in order to receive funding provided through Titles V, XVIII and XIX. The purpose of the legislation is to ascertain that Medicare and Medicaid funds are not utilized inappropriately; but it is also to see that certain performance levels are observed by physicians, nurses and other practitioners.

The hospitals and other medical care facilities of the Veterans Administration are not funded through these sources; nevertheless, the same philosophy of setting and adhering to high standards of practice through peer review has been adopted by the VA for its health delivery system. The Health Standards Review Organization (HSRO) responsible for the maintenance of standards in the various centers operate much the same way as do PSRO's for hospitals outside the VA.

The greatest difficulty encountered by hospitals in adhering to the legislation requiring medical review is that the recommended procedure is to have local groups of physicians establish the standards of practice that are to be followed. This is based on the belief that unless physicians establish their own standards for practice, they will not adhere to them. The result is that in some cases, where a hospital is very small, a specialist might serve as a committee of one to set his own standards and review his own procedures in the care of his patients. There are disadvantages for large hospitals too: for example, the time required for committees of specialists to sit down and write out standards for each disease entity they may treat—standards which will surely change with the ever expanding growth of medical knowledge. Physicians faced with such a challenge—which has no end—may consider adopting standards set by their peers and updated continuously through a computerized database.

Education. Once the Problem Oriented Medical Record, peer review mechanism, audit and re-audit have been computerized for the VA satellite network the next step would be to base continuing education courses and in-service training on the outcomes of patient record audits. There would have to be a means whereby an individual hospital could derive what courses were needed by its own physicians, nurses and allied health professionals, based upon their performance as compared to the expected standards of practice. The computer system operating via the satellite could provide this information.

Such a computerized system is already operational at Ohio's Medical Advance Institute. In conjunction with ROCOM (a branch of Hoffman LaRoche) the system provides a concurrent, retrospective and outcome audit of patient records. It is able to evaluate records according to the PSRO standards, and provide information as to how an individual physician performs as compared with other physicians in the same hospital. It also can compare one hospital with another in the way certain diseases are managed.

Using such a computerized system, the VA Communications Center could provide educational and training programs when needed, to update and improve the standards of care in each facility within the network. Once a need for information had been identified, either by the hospital peer review group responsible for records audit, or by an individual practitioner for himself, the VA satellite network would provide access to appropriate educational and training resources to meet the need.

If the information requirement was very specific, related to the diagnosis or management of a particular patient, and time was an important factor, this need would come under the category of a consultation. The system for providing consultations will be considered in the next subsection. If the information requirement was more general, perhaps to bring a group up-to-date on a new procedure, or to refresh them in areas they learned at one point but have since forgotten, the the problem could be dealt with through continuing education or in-service training.

With such a system, local chiefs of continuing education or in-service training could have access, through the Communications Center, to computerized listings, abstracts and, when needed, full print-outs of journal articles, publications and other medical documents, possibly through an arrangement with the National Library of Medicine. A similar cataloguing of non-print media—video tapes, films, film strips and others—would also be provided through the Communications Center. The catalog of non-print media would list these media by key identifying words; print-outs from the computer would list program titles, abstracts, where the programs are available, target audience, objectives, and ratings by a review committee as to technical and content excellence.

Human resources might be tapped in a similar way. A

computerized database, available at the Communications Center, would include individuals listed according to specialty or skill. The database could be queried by anyone interested in gaining information on a particular subject or technique, and discussions might be initiated between the individual making the query and the specialist, or among several learners and specialists. If queries were made often about a particular skill or aspect of a specialty, a video tape might be produced to cover frequently requested information. The production capabilities of the Communications Center would be called upon to develop, produce and disseminate such video tapes.

The need for the production of new video tapes might come to the attention of the center through several other sources, also. Frequent requests for journal articles on a specific topic might initiate discussion about producing a program on the topic. Requests for non-print media that go unfilled because none are available on the subject also might initiate the production of programs to fill the gap. New programs or methodologies introduced by the VA for its health system might be initiated with a carefully produced video tape on the subject, to be presented live and followed by a two-way discussion via satellite. To produce such video tapes the production staff would call upon appropriate specialists within the VA, as well as those outside, to act as faculty coordinators.

Another function of the production component of the center would be to make video tapes of special techniques developed in individual VA centers. This way, if a particularly excellent methodology for sterilizing surgical instruments, or rehabilitating a spinal cord injured patient, was developed in one facility, it could be disseminated quickly and effectively to all appropriate facilities.

The satellite would be utilized to disseminate these materials when two-way discussion was an integral part of the learning. For this purpose, only a few hospitals would be linked simultaneously for electronic discussion by satellite. They could be divided according to interest or geography. For example, if the subject of a particular program was highly specialized, so that only a few individuals in several VA hospitals were interested in it, the "discussion group" might include ten or twelve hospitals spread from Maine to Tennessee. If the subject were more general, so that many people in most hospitals would like to participate, the "discussion group" might encompass a smaller geography; and many discussions on the topic could occur simultaneously.

The primary restriction on the use of the satellite for these educational purposes would be bandwidth requirements. Two-way television requires the widest spectrum, so that few other communications can flow back and forth while a two-way television program is being carried by the satellite. Most instructional sessions do not require two-way video, however. In fact, a great deal can be accomplished using a narrow-band audio channel supplemented with slow scan capabilities for carrying visual information. Discussions via computer, using cathode ray tubes for real-time communication and printed read-outs for reference, would be another use of narrow bandwidths carried by satellite.

Consultation. When a physician or other type of practitioner has a specific question related to the diagnosis, or management of a patient's illness, and time is an important factor, his need for information is in the category of a consultation. He would then be able to access the Communications Center Consultation System.

When he called into the center, either via satellite or by telephone, he would be placed in contact with a consultation coordinator. The coordinator would first try to provide the information needed through available literature; an instant check via computer. If the information derived by this means was inadequate, the coordinator would then go to the human resources database to find an individual, or several individuals, who were specialists or skilled in the problem area. These individuals would be coded according to their availability to act as consultants. (All specialty areas included in the database would be covered 24 hours a day, every day by individuals prepared to act as consultants for certain time periods, "covering" the specialty in the same way that 24 hour emergency rooms are "covered" by groups of physicians.) The inquirer could then contact the individual acting as consultant for the specialty area for that time period.

For specialties for which there are many requests for consultations, individuals might be retained to serve at the Communications Center as resources for that specialty. They would answer questions and otherwise serve as consultants for practitioners in VA hospitals throughout the country. They would also act as faculty coordinators for videotape programs and for other materials produced in their specialty area.

Diagnoses. The availability of telemetry, incorporating electronic sensors that can operate over great distances, means that a consultant can examine a patient, with the help of a nurse or physicians's assistant or other trained personnel, and observe the patient's X-rays and laboratory findings, virtually as well via satellite, as he can from the same room with the patient and consulting physician. The centralization of special diagnostic equipment, located in the same physical complex as the specialists trained to use it and to interpret its results, would make the most efficient use of both specialists and equipment.

A comment heard frequently when programs on special diagnostic devices were shown via ATS-6 to the ten participating hospitals was: "It was interesting but the program wasn't particularly useful to us. We don't have that equipment here, and we probably won't have it in the future either."

The reason most VA hospitals are not equipped with sophisticated and expensive diagnostic machines is that special training is required to use them, and the number of patients who could benefit from the use of such devices is not sufficient to warrant the enormous expenditure for every hospital. The cost for a few such devices would be justified, however, if all the facilities included in the satellite network could use the devices, via satellite, for the patients who come to their hospitals, and if the results could then be interpreted by specialists at the Communications Center. Ultimately, it is possible that all patients seen at VA hospitals and centers could be examined by a central, computerized system of multi-phasic screening.

The computerized diagnostic system could also be carried to the isolated communities served by the nonmetropolitan VA hospitals. Nurses or physician assistants might take transportable computer terminals with them for home visits. The probabilities program could be accessed for assistance in taking histories and making home diagnoses. When determining treatment or finding resources for rehabilitation and home care, the terminal could again be used to access the computer. The nurse's decisions would be checked by the computer, which would add some alternatives if the decisions weren't justified. A physician at the center would be on hand for further backup and confirmation of action, if needed.

Cost Effectiveness

The subject of cost has woven a thread throughout this report, from the first mention of the VA's participation as an experimenter on the ATS-6, to this last discussion of con-

clusions and possible future uses of satellite communications. Cost and benefits will be considered next in a more specific discussion of this important aspect of a satellite communications system for the VA.

Naturally, an experiment, involving only ten hospitals cannot be particularly cost-effective since all of the production and related activity will be directed to only several hundred participating health professionals. The experiment is justifiable, however, despite its high cost per professional/hour, if it can demonstrate a potential cost-effectiveness when such educational and consultative linkages are projected over the entire VA system. The ATS-6 experiment did indeed demonstrate that such linkages lead to positive changes in many cases, and it is clear that terrestrial facilities for establishing the linkages would cost many times the amount of a satellite interconnection. Two important questions remain regarding cost-effectiveness:

1. Are patient care benefits created by weekly interactive professional exchanges worth an investment of $2.50 per hour for each participating health professional? (This is the maximum projected cost for a system-wide weekly exchange, including the highest projected cost for satellite time, production and management functions. It is based on a total overall cost of $10,000 per hour divided by 25 health professionals in each of 161 hospitals or 4,000 participating professionals.)

2. What will be the actual hourly tariff for a nationwide television satellite linkage involving all VA hospitals? (The maximum tariff projected to date has been $2,000 per hour for one-way video nationwide. This figure was used to compute the hourly cost per health professional cited above. However, if the hourly satellite tariff is less, it would of course reduce the cost per professional/hour accordingly. Some estimates have been as low as $500 per hour.)

The answer to question number one must be determined by the VA Central Office. In the opinions of the project contractors and authors of this report, even the pessimistic figure of $2.50 per participating professional is a worthwhile investment considering the likely outcome on patient care. The system becomes much more cost-effective when resulting software is distributed and retrieved on videocassette. Health professionals who are exposed to the materials in a passive or non-interactive viewing situation may be reached for considerably less than $1.00 per viewer per hour. Although it has been demonstrated that such passive viewing is less desirable than interactive participation, it is sometimes the only means of reaching certain members of the health team (i.e., night shift nurses and paramedical personnel).

The uplink frequency restrictions which prohibited actual teleconsultations on a one-to-one basis have made it impossible to develop realistic cost projections for such teleconsultations at this point. Additional experimentation is needed, with carefully controlled one-to-one teleconsultations, in order to project the ultimate cost of such linkages with video, slow scan, audio, and the extension of diagnostic tools by satellite. Future experimentation in this area should be designed to assess utilization patterns, so that cost projections will reflect 8-hour, 16-hour, and 24-hour service.

Finally, with regard to cost, it must be pointed out that a conventional terrestrial microwave linkage of 171 VA hospitals would cost upwards of $25,000 per hour plus installation and construction charges. If it is determined that these linkages are of significant value to Veterans Administration hospital personnel and patients, the $2,000 per hour projected maximum cost for a noncommercial nationwide satellite linkage is clearly an important breakthrough.

Relationship of the VA Satellite-Mediated Communications Network with the Outside Medical Community

The VA Satellite Communications Network could potentially serve many functions for the medical communities surrounding the VA hospitals included in the network. These VA network hospitals could become teaching centers for the physicians, nurses and allied health professionals practicing in the community. When facilities were available, these professionals would be invited to participate in continuing education and in-service training courses offered at the VA hospitals. They might choose to become subscribers to the videotape programs developed and produced at the center, and to participate in regional workshops offered via the satellite. The possibilities of interchange with the medical community are numerous, both for the development of programs, and for their utilization.

The VA system for computerized patient care management, based upon the Problem Oriented Medical Record, may one day serve as a model for other hospitals and medical centers. Such medical care providers might be invited to participate with the VA in establishing a computerized, continuously updated patient care audit system that will be utilized throughout the nation. Such a nationwide standard of practice seems inevitable, based upon the more and more commonly held belief that excellent medical care is a patient's right.

The "local standard" of medical practice that now inhibits such a nationwide standardization, will probably be both unfeasible and inadequate in the future. As discussed earlier in the section, the legislation requiring medical audit according to local standards has proved difficult to adhere to when hospitals try to establish their own standards of practice. But the "local standard" may be inadequate for another reason, too. Legalistically, the standard of medicine practiced in the community has until now been the measure for adjudicating malpractice suits. It means that if the physician-defendant performs according to the standards of his peers in the community, he should not be found guilty of malpractice.

The precedent set by a 1968 Massachusetts case, *Brune vs. Bellinkcoff*, may change that standard. According to the decision in the case, the "locality rule" is unsuited to the conditions of the times. Medical practice should no longer be "Balkanized," so that care delivered in small communities distant from teaching centers is measured by different standards than those for larger metropolitan areas. In Massachusetts the new acceptable measure would be the average qualified practitioner of the speciality, wherever he may practice, "taking into account the changes in his practice."

The Massachusetts "average practitioner" standard has not yet taken the place of the "local standard" for most states. But, the legislation requiring medical audit according to preset standards may provide the impetus for "de-Balkanization." For many reasons, from efficiency to the expectations of the patient, a nationwide standard seems inevitable: and the largest health care delivery system in the nation would seem to have a logical place in its derivation, administration, dissemination and maintenance.

RECOMMENDATIONS

A satellite-mediated, VA health network, interconnecting 383 VA facilities and managing medical audits, educational programs, diagnoses and consultations for its own and other facilities, is probably a far future achievement. Some

technological advancements and philosophical changes must first be accomplished. In the meantime, a general recommendation resulting from the VA/ATS-6 communications experiment would be that the Veterans Administration continue in its role as an active leader in the field of satellite communictions.

Specifically, recommendations for immediate action are:

1. Since it has been demonstrated that satellite communications have an over-all positive impact in terms of seeking and accepting new knowledge on the medical staff and other health professionals in isolated VA hospitals, the VA should continue experimentation with available satellites provided that: (a) the expenditure for experimentation is within reason (leading toward a permanent satellite service); and (b) the available satellite is technically capable of providing the proposed linkage to VA hospitals on a dependable basis.

2. An appropaiate VA representative should be given the responsibility for maintaining contact with the National Aeronautics and Space Administration, the Public Service Satellite Consortium, and the domestic carriers, so that the agency will be aware of future satellite opportunities.

3. The VA should become a member of the Public Service Satellite Consortium or its governmental counterpart and participate in negotiations for long-term domestic satellite linkages for at least all of its non-urban hospitals.

4. Because of its experience with ATS-6, the VA should assume a leadership role among other government agencies in exploring the feasibility of a government-shared satellite, should the consortium and other common carriers fail to provide necessary resources within a reasonable period of time.

5. As part of its outreach program, any future VA satellite communications should be made available to hospitals and practitioners outside the VA system.

6. An ultimate permanent nationwide linkage of all VA facilities should involve satellite tariff charges of $2,000 per hour or less. (Some estimates run as low as $500 per hour. This works out to $12.50 per hospital or about $.31 per viewer based on ATS-6 attendance averages. Not including production related changes.)

7. In a permanent (non-experimental) satellite Post-Graduate Education Series, *all* programs should be accompanied by printed study guides.

8. Until additional satellite linkages are available to the VA, consideration should be given to providing films and video tapes for continuing education of health professionals in non-affiliated VA hospitals.

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